2002 INTERIM GROUNDWATER MONITORING REPORT

FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

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OTISVILLE, MICHIGAN

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EXECUTIVE SUMMARY

Conestoga-Rovers & Associates (CRA) conducted the Interim Groundwater Monitoring Event at the Forest Waste Disposal Site (Site) on behalf of the Forest Waste Coordinating Committee (FWCC) in September 2002. Groundwater samples for analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and metals were collected from nine monitoring wells (MW84-1S, MW84-4S, MW84-5S, MW84-6S, MW86-6S, MW90-3S, MW90-4S, MW95-1S, and MW95-2S). These locations immediately east, north, south, and west of the landfill are consistent with United States Environmental Protection Agency's (U.S. EPA's) request of April 3, 2002.

The results of the Interim Groundwater Monitoring Event and recommendations pertaining to this event are presented in detail in this report, and are summarized below.

GROUNDWATER FLOW DIRECTION

A complete round of groundwater level data was collected by CRA during the 2002 Interim Groundwater Monitoring Event. Groundwater flow direction in the Shallow Aquifer and hydraulic gradients were found to be consistent with those reported during previous events. Groundwater flow north of the landfill flows to the northwest and northeast in the Shallow Aquifer, and groundwater flow in the Deep Aquifer is generally east to west.

VOLATILE ORGANIC COMPOUNDS

Concentrations of VOCs were below their detection limits in six of the nine monitoring locations. Several VOCs were detected at concentrations above Part 201 DWC at MW95-1S, one VOC was detected above Part 201 DWC at MW84-1S, and one VOC was detected below Part 201 DWC at MW90-4S.

Concentrations of acetone, toluene, ethylbenzene, 2-butanone, 4-methyl-2-pentanone, xylenes, and methylene chloride in MW95-1S were consistent with concentrations measured during recent monitoring events. Concentrations of these compounds have decreased significantly since 1996.

Concentrations of benzene, trichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, and chlorobenzene in MW95-1S were consistent with concentrations measured during recent monitoring events. Concentrations of these compounds have remained relatively stable since 1996.

Concentrations of 1,1-dichloroethane, cis-1,2-dichloroethene, vinyl chloride, and chloroethane in MW95-1S have increased since 1999.

SEMI-VOLATILE ORGANIC COMPOUNDS

SVOCs were all below their detection limits in all wells sampled during the 2002 Interim Groundwater Monitoring Event. However, the method detection limits of several SVOCs were above their respective criteria.

METALS

Six metals (arsenic, lead, manganese, mercury, and zinc) were detected above their respective Part 201 DWC. However, iron and manganese were most commonly detected above criteria. As expected, concentrations of metals above Part 201 DWC were highest in wells closest to the landfill. Metals concentrations above Part 201 DWC were detected in wells north, east, and in one of three wells west of the landfill. Concentrations were below criteria in wells south and in two of three wells west of the landfill.

GENERAL CHEMISTRY

The results for the general chemistry for the 2002 Interim Groundwater Monitoring Event indicate that the groundwater conditions near the landfill are reducing, which is consistent with the results from previous sampling rounds.

RECOMMENDATIONS

Continued monitoring of groundwater at the Site is recommended. The Long-Term Monitoring Plan (LTMP) will be developed following the selection of the remedy for the Site. The well network for the LTMP will incorporate the north plume, and the area surrounding the landfill. The LTMP will become the definitive monitoring document for the Site.

1.0 INTRODUCTION

This report summarizes the results of the Interim Groundwater Monitoring Event for the Groundwater Operable Unit Remedial Action at the Forest Waste Disposal Site (Site) located near Otisville, Michigan (Figure 1.1). This monitoring event was conducted in September 2002.

The Groundwater Monitoring Program (Program) at the Site was initially based on the Groundwater Monitoring Manual (Manual), dated November 20, 1989. The Manual in turn was based on the Remedial Investigation (RI) data and did not consider the impacted groundwater north of the landfill. As a result, the 1989 program did not monitor the most relevant areas of the Site. Based on this fact, the Forest Waste Coordinating Committee (FWCC) requested an interim modification of the requirements of the monitoring program in a letter dated March 22, 2000, and revised on April 17, 2000. The modification was approved by the United States Environmental Protection Agency (U.S. EPA). In a letter dated April 3, 2002, U.S. EPA requested revisions to the Interim Monitoring Plan, which included the sampling of different wells and the inclusion of semivolatile organic compounds (SVOCs) and metals to the sampling plan. These changes were incorporated into the September 2002 sampling event.

Conestoga-Rovers & Associates (CRA) initiated the groundwater sampling activities in the month of September 2002.

1.1 AUTHORIZATION

CRA completed the September 2002 Interim Groundwater Monitoring Event on behalf of the FWCC. This work was completed in accordance with the Groundwater Monitoring Manual (CH2M Hill, November 20, 1989), as amended, and the Quality Assurance Project Plan (QAPP, CH2M Hill, September 29, 1989), which define and describe the groundwater monitoring program for the Site. Both documents were developed for, and approved by, U.S. EPA.

1.2 SITE DESCRIPTION

The Site is located in Forest Township, Genesee County, Michigan. The Site is approximately 192 acres in size and contains an approximately 10-acre landfill and a 1-acre former lagoon area, both of which have been remediated pursuant to remedial actions under the Comprehensive Environmental Response, Compensation, and

Liability Act (CERCLA) of 1980, 42 USC § 9601. The Site is surrounded by rural residential land, farm land, and undeveloped wood lots. A Site plan, showing the monitoring well sample network, is presented on Figure 1.2.

1.3 PURPOSE AND SCOPE OF WORK

The primary purpose of this groundwater sampling event is to monitor solute concentrations downgradient from the landfill. The scope of work for the interim groundwater sampling event consisted of the following activities:

- inspection of the Site monitoring well and piezometer conditions;
- purging and sampling of groundwater for laboratory analysis from nine monitoring wells;
- data validation of laboratory analytical data;
- database management of laboratory analytical data;
- comparison of validated analytical data to Part 201 Drinking Water Criteria; and
- documentation and reporting of sampling activities, field and analytical data, results of data evaluations, and recommendations.

2.0 GROUNDWATER MONITORING RESULTS

CRA collected groundwater level data from existing monitoring wells and piezometers at the Site. Groundwater samples from the 9 monitoring wells (MW84-1S, MW84-4S, MW84-5S, MW84-6S, MW86-6S, MW90-3S, MW90-4S, MW95-1S, and MW95-2S) were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs) using the Contract Laboratory Program (CLP) Routine Analytical Services (RAS). All of the wells, with the exception of MW95-1S were also sampled for TCL Semi-Volatile Organic Compounds (SVOCs). The groundwater samples were analyzed for Target Analyte List (TAL) Metals and MW95-1S was analyzed for general chemistry. The wells sampled during the 2002 Interim Groundwater Monitoring Event and the list of analytes are consistent with a request from the U.S. EPA in their April 3, 2002 letter.

Groundwater level measurements, monitoring well purging, collection of field parameter data and collection of groundwater samples were conducted in accordance with the methods described in the QAPP.

The analytical data collected during the 2002 Interim Groundwater Monitoring Event were reviewed for accuracy and conformance with the analytical methods and accepted laboratory procedures. Analytical data were assessed to determine whether any qualifications were necessary based on holding time criteria, instrument calibrations, method blank samples, ICP interference check samples, laboratory control samples, surrogate recoveries, matrix spikes, duplicate samples, internal standards, sample quantitations, field blanks, field duplicates, and trip blanks.

The data were found to exhibit acceptable levels of accuracy and precision as qualified in Table 5 of the data quality assessment and validation memorandum presented in Appendix A.

2.1 GROUNDWATER ELEVATIONS

CRA collected groundwater level measurements from 36 Shallow Aquifer and 22 Deep Aquifer monitoring locations at the Site. The depth to groundwater and groundwater elevations for the 2002 Interim Groundwater Monitoring Event are presented in Table 2.1. The measured groundwater level data for the 2002 Interim Groundwater Monitoring Event were used to produce groundwater elevation contours for the Shallow and Deep Aquifers presented on Figures 2.1 and 2.2, respectively.

The groundwater elevation contours shown in the respective figures for the shallow aquifer were created based on Version 7.0 of Surfer for Windows (Golden Software, Inc.). A linear variogram model was used to characterize the data in a kriging scheme with linear drift.

The groundwater elevations and flow directions for the shallow and deep aquifers are consistent with previous groundwater monitoring events. Figure 2.1 presents the potentiometric surface in the shallow aquifer in the vicinity of the Site. Groundwater flow in the shallow aquifer is generally radial away from the landfill, with flow from the landfill area predominantly to the northwest, and northeast. Groundwater elevation data collected in 2002 were used to calculate hydraulic gradients of 0.009 ft/ft, 0.006 ft/ft, northwest and northeast of the landfill, respectively. These values are consistent with hydraulic gradients calculated using hydraulic data collected since 1998. Prior to 2002, groundwater southeast of the landfill flowed southeast. The hydraulic gradient in this area was 0.002 ft/ft. In 2002, the groundwater southeast of the landfill appeared to be flowing northeast. Continued monitoring will reveal whether the reversal in groundwater direction is long term.

Figure 2.2 presents the potentiometric surface in the deep aquifer in the vicinity of the Site. Groundwater flow in the deep aquifer beneath the landfill is generally northward, but groundwater flow in the Deep Aquifer north of the landfill is generally to the west. Horizontal hydraulic gradients in the Deep Aquifer beneath the landfill and north of the landfill are 0.0005 ft/ft and 0.0004 ft/ft, respectively. These values were calculated using available groundwater elevation data collected in 2002, because these monitoring rounds included the greatest number of Deep Aquifer monitoring wells.

2.2 FIELD MONITORING

CRA collected field parameter data from the nine monitoring wells included in the 2002 Interim Groundwater Monitoring network. The field parameter data are presented in Table 2.2.

The field parameter data are collected primarily to assess stabilization of the parameters and to ensure that representative formation groundwater is collected. The field parameter data indicate that stabilization was achieved prior to sample collection.

2.3 LABORATORY ANALYTICAL RESULTS

The validated results for the laboratory analyses are presented in Table 2.3 to Table 2.6 for TCL VOCs, TCL SVOCs, TAL metals, and general chemistry parameters, respectively.

Temporal concentration trends were graphed for analytes that exceeded action levels at MW95-1S, which is located immediately downgradient in the north end of the landfill in the shallow aquifer. These graphs are presented on Figures 3.1 to 3.17.

2.3.1 VOLATILE ORGANIC COMPOUNDS

The VOC results from the groundwater samples collected during the 2002 Interim Groundwater Monitoring Event are presented in Table 2.3. The following table summarizes the VOCs that exceeded their respective Michigan Department of Environmental Quality (MDEQ) Part 201 Drinking Water Criteria (DWC).

Parameter	*Monitoring Well*	*Concentration (µg/L)*	*Part 201 Drinking Water Criteria (µg/L)*
1,2-Dichloroethane (1,2-DCA)	MW84-1S MW95-1S	8 23	5
1,1-Dichloroethane (1,1-DCA)	MW95-1S	4,900	880
1,1-Dichloroethene (1,1-DCE)	MW95-1S	15	7
Acetone	MW95-1S	1,100	730
Benzene	MW95-1S	140	5
Chloroethane	MW95-1S	3,600	430
cis-1,2-Dichloroethene (cis-1,2-DCE)	MW95-1S	2,200	70
Ethylbenzene	MW95-1S	350	74
Dichloromethane (DCM)	MW95-1S	220	5
o-Xylene	MW95-1S	320	280
Toluene	MW95-1S	1,100	790
Vinyl chloride	MW95-1S	1,700	2
Xylene (total)	MW95-1S	1,160	280

As indicated above, Part 201 DWC were exceeded in MW95-1S for BTEX parameters, 1,1-DCA, 1,2-DCA, chloroethane, 1,1-DCE, cis-1,2-DCE, vinyl chloride, methylene

chloride, and acetone. Concentrations of 2-butanone, 4-methyl-2-pentanone, chlorobenzene, and trans-1,2-DCE were detected below their respective criteria. Concentrations of VOCs at MW95-1S were consistent with those measured during the 2001 Interim Groundwater Monitoring Event. In general, concentrations of VOCs in MW95-1S have decreased compared to concentrations measured in 1996. The exceptions are cis-1,2-DCE, 1,1-DCA, chloroethane and vinyl chloride, which increased in concentration from 1999 to 2001.

Toluene was detected below its Part 201 drinking water criterion in MW90-4S. 1,2-dichloroethane was detected above its criteria in MW84-1S. VOCs were not detected above the Method Detection Limits (MDLs) in the remaining wells sampled in September 2002.

2.3.2 SEMI-VOLATILE ORGANIC COMPOUNDS

The results for the SVOCs analysis of the samples collected during the 2002 Interim Groundwater Monitoring Event are presented in Table 2.4. The results indicated that all SVOCs were below their respective method detection limits. However, the method detection limits for several compounds were above their DWC. The results are consistent with results from previous sampling events. The exception is MW95-1S, which was not sampled for SVOCs during the 2002 sampling event.

2.3.3 METALS

The results of the metal analysis from the groundwater samples collected during the 2002 Interim Groundwater Monitoring Event are presented in Table 2.5. The table below summarizes the concentrations of metals detected above DWC from the nine monitoring wells sampled. Total metal concentrations were measured in all wells except MW95-1S, where total and dissolved metal concentrations were measured. Because low-flow purging sampling techniques were used, total and dissolved metals concentrations should be equal, therefore the highest values for total or dissolved metals from MW95-1S are shown in the table.

Parameter	*Monitoring Wells*	*Concentration (mg/L)*	*Part 201 Drinking Water Criteria (mg/L)*
Arsenic	MW95-1S	0.062	0.05
Iron	MW84-1S	0.88	0.3

Parameter	*Monitoring Wells*	*Concentration (mg/L)*	*Part 201 Drinking Water Criteria (mg/L)*
	MW86-6S MW95-1S	123 9.6	
Lead	MW86-6S	0.251	0.004
Manganese	MW84-1S MW86-6S MW90-3S MW90-4S MW95-1S	0.12 0.24 0.08 0.68 0.06	0.05
Mercury	MW90-4S	0.014 J	0.002
Zinc	MW86-6S	29.1	2.4

As indicated above, MW86-6S, located immediately west of the landfill, had the most number of metals above criteria (iron, lead, manganese and zinc). MW84-1S (iron and manganese) and MW90-4S (manganese and mercury) each had two metals detected at concentrations above Part 201 DWC, and are located east of the landfill. MW95-1S is immediately north of the landfill and had three metals detected at concentrations above Part 201 DWC (arsenic, iron and manganese). Manganese exceeded Part 201 DWC at MW90-3S, located southeast of the landfill. Metals concentrations in MW84-4S and MW84-5S, located west of the landfill, were below their respective criteria, as were metals concentrations in MW-84-6S and MW95-2S, located south of the landfill. As expected, concentrations of metals above Part 201 DWC were highest in wells closest to the landfill.

2.3.4 GENERAL CHEMISTRY

The results of the general chemistry analyses of the samples collected during the 2002 Interim Groundwater Monitoring Event are presented in Table 2.6. Results from MW95-1S are consistent with those from previous rounds and indicate that conditions in the Shallow Aquifer immediately north of the Site are reducing.

3.0 SUMMARY AND CONCLUSIONS

The following sections present the conclusions of the 2002 Interim Groundwater Monitoring Report at the Site.

3.1 GROUNDWATER LEVEL MEASUREMENTS

Groundwater elevations, gradients and flow directions for both the shallow and deep aquifers are consistent with previous hydraulic monitoring events at the Site. The shallow aquifer groundwater flows in a radial manner with flow from the landfill predominantly to the north and northeast. Groundwater flow in the deep aquifer is towards the west. Horizontal hydraulic gradients in the shallow and deep aquifers were consistent with previous events.

3.2 VOLATILE ORGANIC COMPOUNDS

CRA compared the validated analytical results to the appropriate Part 201 DWC, and to previous events. The results showed that VOCs were not detected at MW84-4S, MW84-5S, MW84-6S, MW90-3S, and MW95-2S. Toluene was detected below criteria at MW90-4S, and 1,2-DCA was detected above criteria at MW84-1S.

In September 2002, Part 201 DWC were exceeded at MW95-1S for acetone, benzene, 1,1-DCA, 1,1-DCE, 1,2-DCA, chloroethane, cis-1,2-DCE, ethylbenzene, methylene chloride, xylene (total) and vinyl chloride.

Concentrations in MW95-1S of acetone, ethylbenzene, toluene, 2-butanone, 4-methyl-2-pentanone, 1,1-DCE, and methylene chloride were consistent with concentrations from the 2001 Interim Groundwater Monitoring Event. Concentrations of these compounds have shown an overall decrease since 1995.

Concentrations in MW95-1S of benzene, chlorobenzene, 1,2-dichloropropane, and trichloroethene (TCE) were consistent with those from previous rounds, and appear to be stable over time.

Concentrations in MW95-1S of chloroethane, 1,1-DCA, cis-1,2-DCE, and vinyl chloride were consistent with concentrations from the 2001 Interim Groundwater Monitoring Event. Concentrations of these compounds have increased since 1999.

Temporal trends of VOCs that have currently or historically exceeded DWC at MW95-1S were analyzed and are presented in graphical form on Figures 3.1 through to 3.17. A description of the results is presented below.

3.2.1 ACETONE

Acetone was detected at 1,100 µg/L at MW95-1S during the 2002 Interim Groundwater Monitoring Event, which is above its Part 201 DWC of 730 µg/L. The concentration of acetone measured in 2002 was similar to concentrations measured in 1999, and is consistent with the results from the 2001 sampling events, which indicated that the acetone was not detected above a detection limit of 2,000 and 5,000. Therefore the concentration of acetone in MW95-1S has remained relative stable since 1999, and has decreased by over an order-of-magnitude since 1996, when the concentration of acetone was 20,000 µg/L. The concentration trend for acetone is shown on Figure 3.1.

3.2.2 TOLUENE

Toluene was detected In MW95-1S at a concentration of 1,100 µg/L, which is above its Part 201 DWC of 790 µg/L. This value is consistent with concentrations measured during the June and August 2001 sampling events (Figure 3.2). There has been a generally decreasing trend in the concentration of toluene at MW95-1S since December 1996, when the maximum concentration was detected (23,000 µg/L). The concentration trend for toluene is shown on Figure 3.2.

3.2.3 ETHYLBENZENE

The concentration of ethylbenzene in MW95-1S was 350 µg/L, which is above its Part 201 DWC of 74 µg/L. The concentration of ethylbenzene in MW95-1S was consistent with the concentrations measured in 2001, and has decreased since its maximum concentration of 4,800 µg/L, measured in December 1996. The concentration trend for ethylbenzene is shown on Figure 3.3.

3.2.4 2-BUTANONE

2-butanone was detected in MW95-1S at 760 µg/L, which is below its Part 201 DWC of 13,000 µg/L. The concentration of 2-butanone has been generally stable since March

1999, but has decreased significantly since December 1996, when it was detected at a concentration of 26,000 µg/L. The concentration trend for 2-butanone is shown on Figure 3.4.

3.2.5 4-METHYL-2-PENTANONE

The concentration of 4-Methyl-2-pentanone in MW95-1S was 1,100 µg/L, which is below its Part 201 DWC of 1,800 µg/L. The concentration of 4-Methyl-2-pentanone has decreased since December 1996, when the maximum concentration of 29,000 µg/L was measured. The concentration trend for 4-methyl-2-pentanone is shown on Figure 3.5.

3.2.6 BENZENE

The benzene concentration measured in MW95-1S was 140 µg/L, which is above its Part 201 DWC of 5 µg/L. The concentration of benzene is consistent with those measured in 1999, but is above the results from 2001, when concentrations of benzene were not detected at detection limits of 20 µg/L and 50 µg/L. Benzene concentrations have increased since 1995, when benzene was not detected above at a detection limit of 1 µg/L, but has been generally stable since 1999. The concentration trend for benzene is shown on Figure 3.6.

3.2.7 XYLENES

Total xylenes were detected in MW95-1S at a concentration of 1,160 µg/L, which is above its Part 201 DWC of 280 µg/L. This concentration is consistent with concentrations reported in 2001 (Figure 3.7). The concentration of total xylenes has decreased by an order-of-magnitude since 1996, when the maximum concentration detected was 21,000 µg/L. The concentration trend for total xylenes is shown on Figure 3.7.

3.2.8 cis-1,2-DICHLOROETHENE

The concentration of cis-1,2-DCE in MW95-1S was 2,200 µg/L, which is above its Part 201 DWC of 70 µg/L. The concentration was consistent with the concentration measured in August 2001, and was lower than the values reported in July 2001. The concentration of cis-1,2-DCE has increased by over two orders-of-magnitude since 1999,

although more data are required to determine if the concentration of cis-1,2-DCE will continue to increase over time. The concentration trend for cis-1,2-DCE is shown on Figure 3.8.

3.2.9 1,1-DICHLOROETHENE

1,1-DCE was detected in MW95-1S at a concentration of 15 µg/L, which is above its Part 201 DWC of 7 µg/L. The concentration of 1,1-DCE is consistent with the results from 2001, when 1,1-DCE was reported as not detected at detection limits of 15 µg/L and 20 µg/L. The concentration of 1,1-DCE measured in 2002 is significantly lower than the concentrations reported in 1995 and 1996, which were 512 µg/L and 480 µg/L, respectively. The concentration trend for 1,1-DCE is shown on Figure 3.9.

3.2.10 TRICHLOROETHENE

Trichloroethene (TCE) was not detected in MW95-1S at a MDL of 10 µg/L. This is consistent with previous sampling results. The highest concentration of TCE detected was 26 µg/L in April of 1999, which is above its Part 201 DWC of 5 µg/L. The concentration trend for TCE is shown on Figure 3.10.

3.2.11 1,1-DICHLOROETHANE

1,1-DCA was detected in MW95-1S at 4,900 µg/L, above Part 201 DWC of 880 µg/L. The concentration of 1,1-DCA is slightly above the concentration measured in July 2001 (3,800 µg/L) and is an order-of-magnitude above the concentrations detected between December 1995 and March 1999. The concentration trend for 1,1-DCA is shown on Figure 3.11.

3.2.12 1,2-DICHLOROETHANE

1,2-DCA was detected in MW95-1S at a concentration of 23 µg/L, which is above its Part 201 DWC of 5 µg/L. This concentration is consistent with the values reported in sampling events since March 1999, but represents a slight increase since 1995, when 1,2-DCA was reported below the detection limit of 1 µg/L. The concentration trend for 1,2-DCA is shown on Figure 3.12.

3.2.13 1,2-DICHLOROPROPANE

1,2-Dichloropropane was not detected in MW95-1S at a detection limit of 10 µg/L, which is above its Part 201 DWC of 5 µg/L. This is consistent with the results from the sampling events since March 1999. 1,2-Dichloropropane was below the detection limits for most of the sampling events since 1995. The concentration trend for 1,2-dichloropropane is shown on Figure 3.13.

3.2.14 CHLOROBENZENE

The concentration of chlorobenzene detected in MW95-1S was 35 µg/L, which is below its Part 201 DWC of 100 µg/L. This is consistent with the results from the sampling events since March 1999. The concentration trend for chlorobenzene is shown on Figure 3.14.

3.2.15 CHLOROETHANE

The concentration of chloroethane detected in MW95-1S was 3,600 µg/L, which is above its Part 201 DWC of 430 µg/L. This is consistent with the results of the 2001 sampling events, but represents an increase of almost 2 orders-of-magnitude from September 1999. The concentration trend for chloroethane is shown on Figure 3.15.

3.2.16 VINYL CHLORIDE

The concentration of vinyl chloride detected in MW95-1S in September 2002 was 1,700 µg/L, which is above its Part 201 DWC of 2 µg/L. The concentration of vinyl chloride has increased since October (1999) when it was below the detection limit of 1 µg/L. Before April 1999 the concentration of vinyl chloride in MW95-1S was below detection limits. The concentration trend for vinyl chloride is shown on Figure 3.16.

3.2.17 METHYLENE CHLORIDE

The concentration of methylene chloride in MW95-1S was 220, which is above its Part 201 DCW of 5 µg/L. The concentration of methylene chloride decreased from

1,200 µg/L in 1996 to 180 µg/L in 1997, and has remained relatively stable since. The concentration trend for methylene chloride is shown on Figure 3.17.

3.3 METALS

Six metals (arsenic, lead, manganese, mercury, and zinc) were detected above their respective Part 201 DWC at the monitoring locations as indicated in Section 2.3.3. However, iron and manganese were most commonly detected above criteria. As expected, concentrations of metals above Part 201 DWC were highest in wells closest to the landfill. Metals concentrations above Part 201 DWC were detected in wells north, east, and in one of three wells west of the landfill. Concentrations were below criteria in wells south and in two of three wells west of the landfill.

3.4 GENERAL CHEMISTRY

The analytical results for general chemistry parameters at MW95-1S indicate that groundwater conditions north of the landfill are generally reducing. This is consistent with the results from previous events.

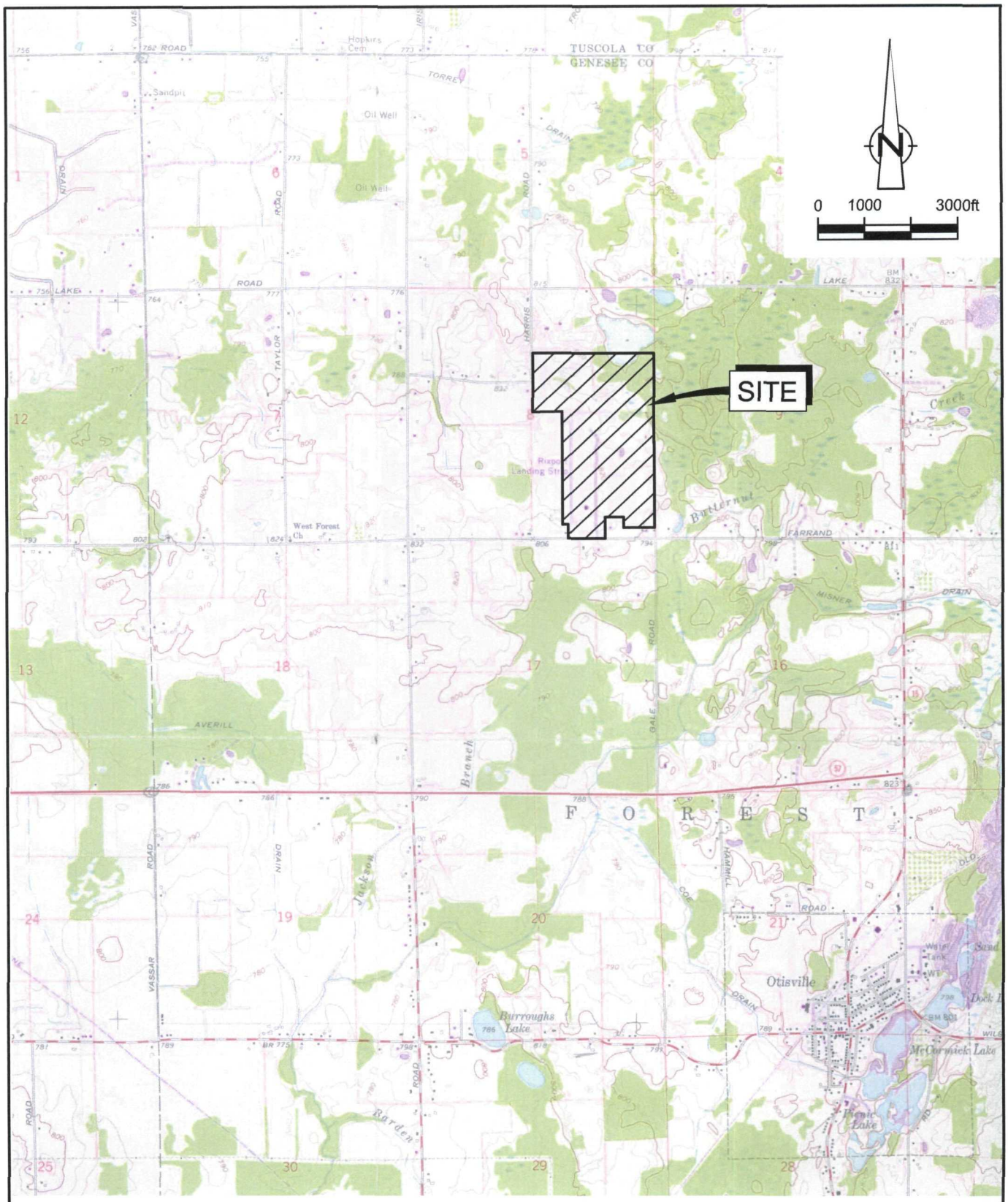
3.5 SEMI-VOLATILE ORGANIC COMPOUNDS

SVOCs were all below their detection limits in all wells sampled during the 2002 Interim Groundwater Monitoring Event. However, the method detection limits of several SVOCs were above their respective criteria.

4.0 RECOMMENDATIONS

Following the selection of the remedy at the Site, a Long-Term Monitoring Plan will be developed, which will include both the north plume area and the area surrounding the landfill. As previously recommended in the 2001 Interim Groundwater Monitoring Report, the revised Long-Term Monitoring Plan will become the definitive monitoring document for the Site.

FIGURES

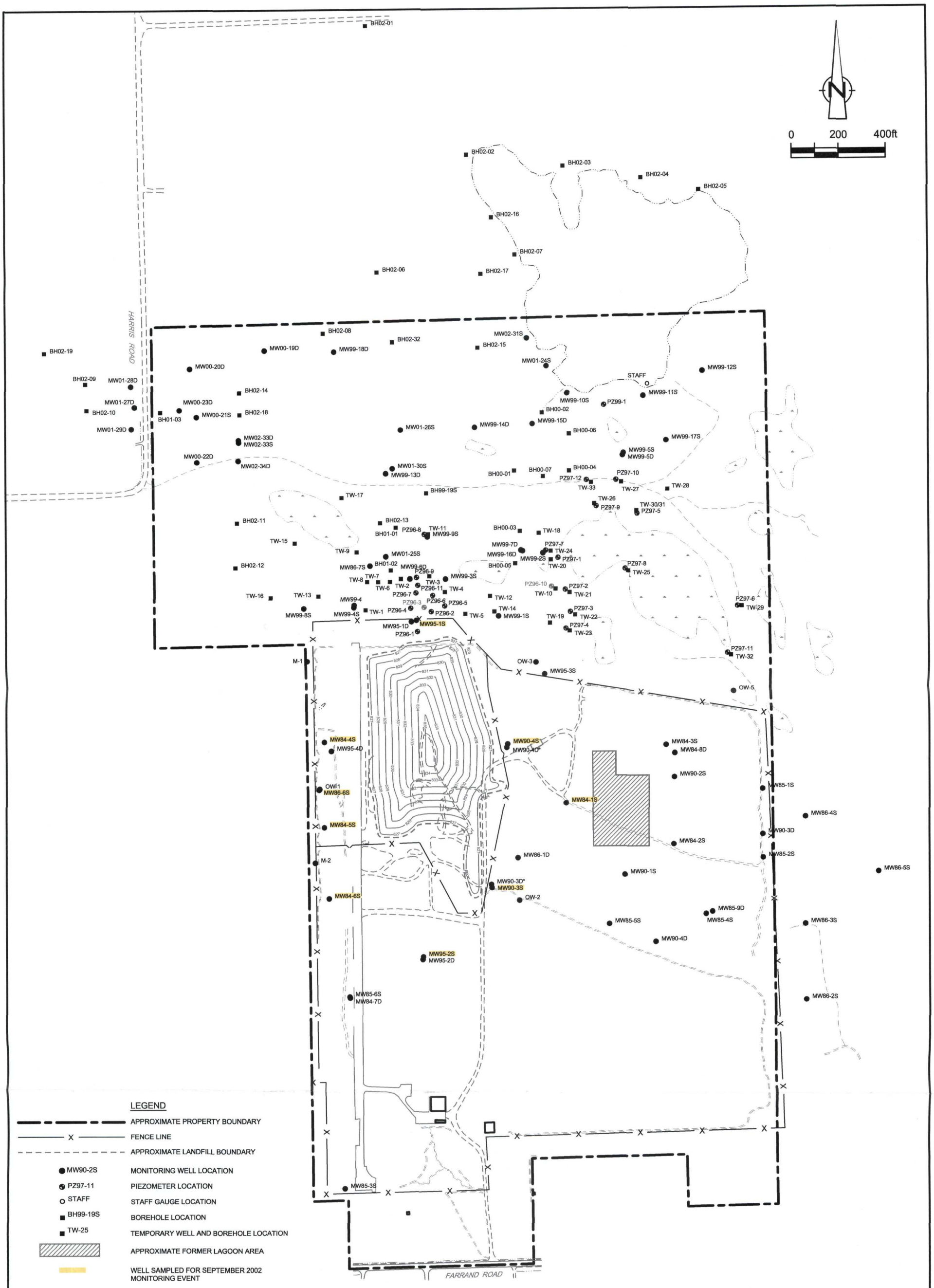


SOURCE: USGS QUADRANGLE MAPS;
OTISVILLE, MICHIGAN

figure 1.1

SITE LOCATION
FOREST WASTE DISPOSAL SITE
Otisville, Michigan

12210-40(011)GN-WA004 MAY 06/2003



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- FENCE LINE
- APPROXIMATE LANDFILL BOUNDARY
- MW90-2S — MONITORING WELL LOCATION
- PZ97-11 — PIEZOMETER LOCATION
- STAFF — STAFF GAUGE LOCATION
- BH99-19S — BOREHOLE LOCATION
- TW-25 — TEMPORARY WELL AND BOREHOLE LOCATION
- APPROXIMATE FORMER LAGOON AREA
- WELL SAMPLED FOR SEPTEMBER 2002 MONITORING EVENT

NOTE:
PZ96-3 AND PZ96-10 HAVE BEEN DESTROYED.

MICHIGAN SOUTH SPC NAV83 US SURVEY FEET

figure 1.2

SITE PLAN AND MONITORING NETWORK
FOREST WASTE SITE
Otisville, Michigan

12210-40(011)GN-WA003 MAY 06/2003

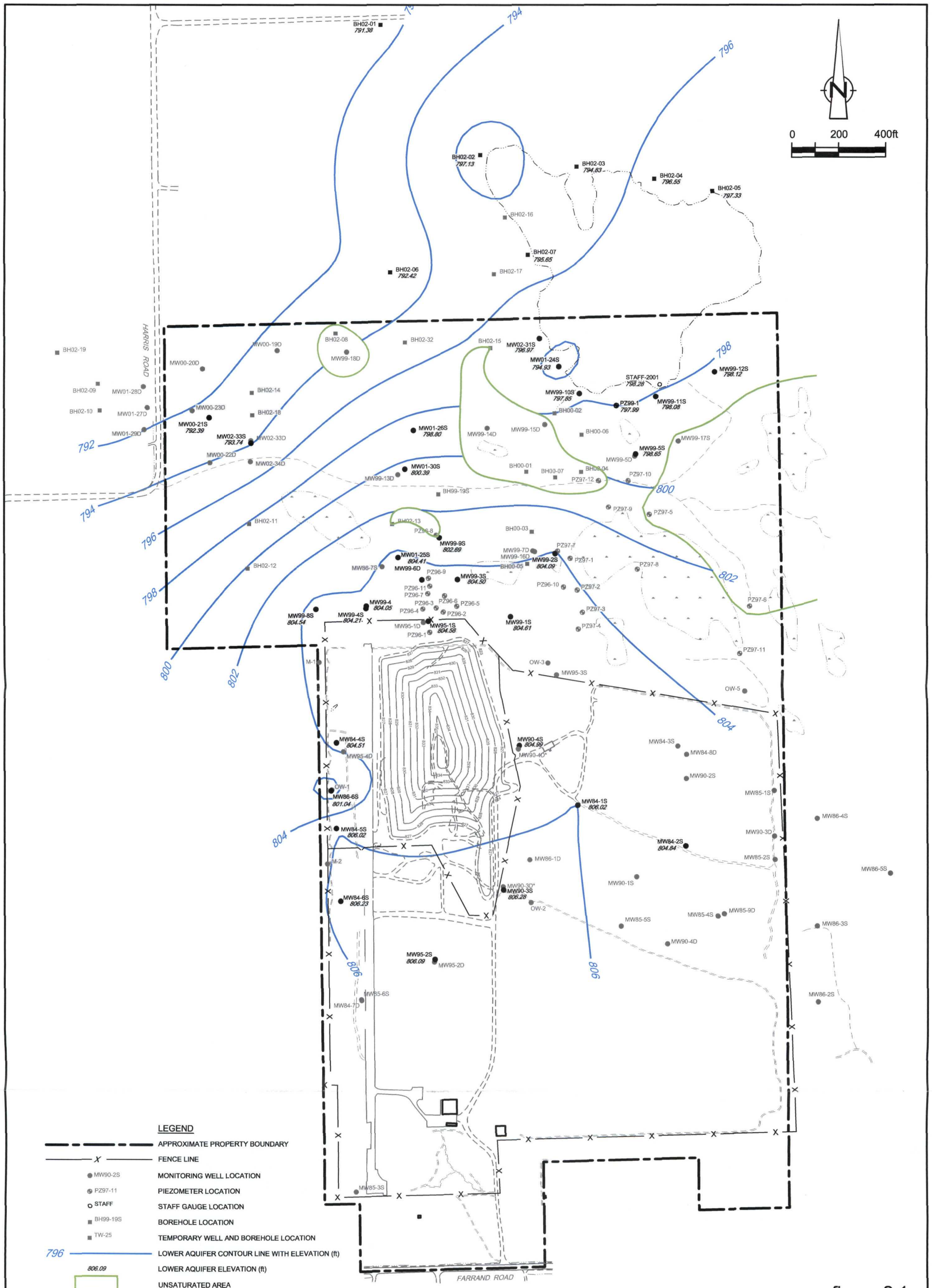


figure 2.1

SEPTEMBER 2002 GROUNDWATER ELEVATION CONTOURS - SHALLOW AQUIFER FOREST WASTE SITE

Otisville, Michigan

12210-40(011)GN-WA001 APR 24/2003

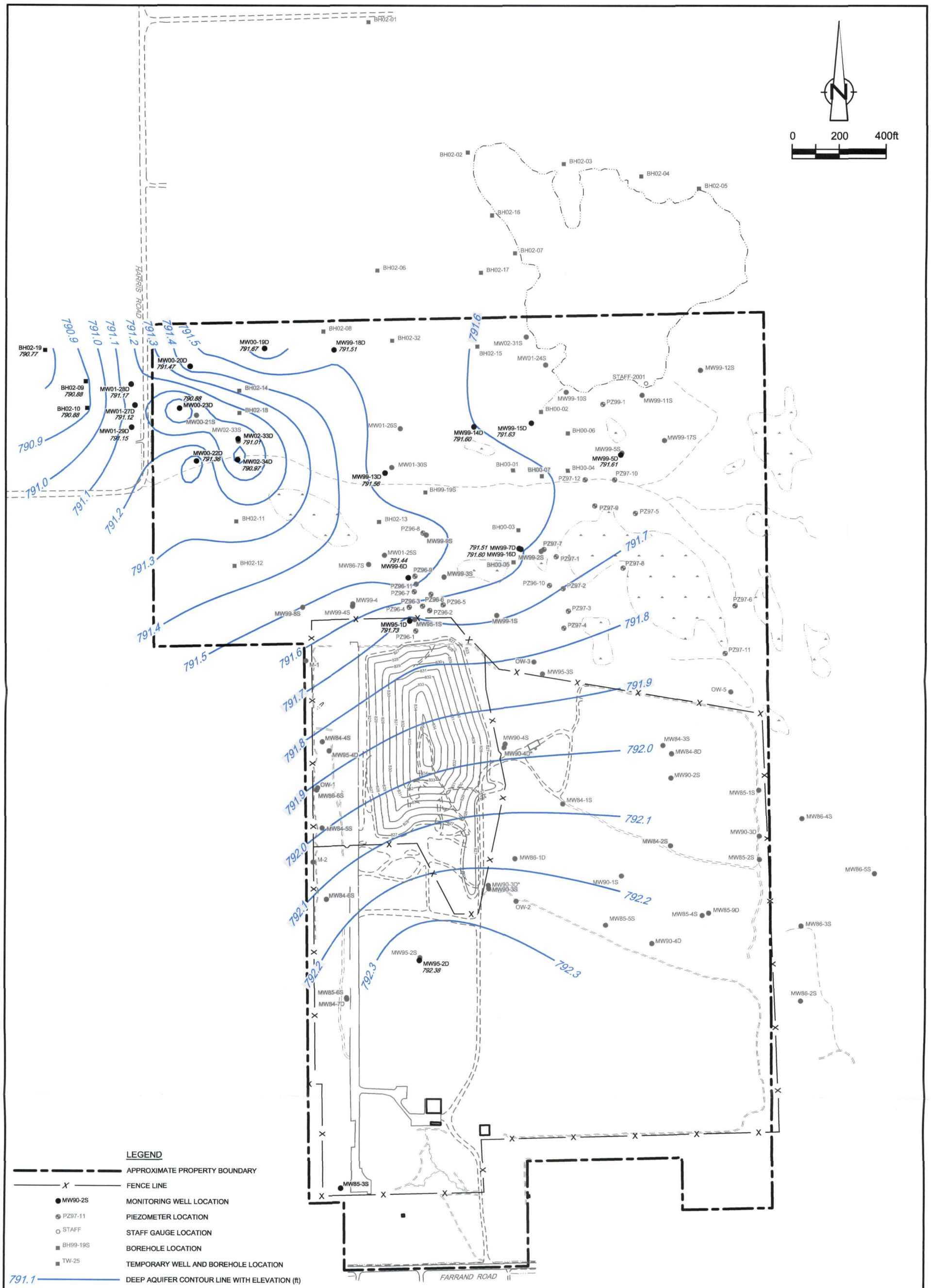


figure 2.2

SEPTEMBER 2002 GROUNDWATER ELEVATION CONTOURS - DEEP AQUIFER FOREST WASTE SITE

Otisville, Michigan

NOTE:
PZ96-3 AND PZ96-10 HAVE BEEN DESTROYED.

MICHIGAN SOUTH SPC NAV83 US SURVEY FEET

12210-40(011)GN-WA002 APR 22/2003

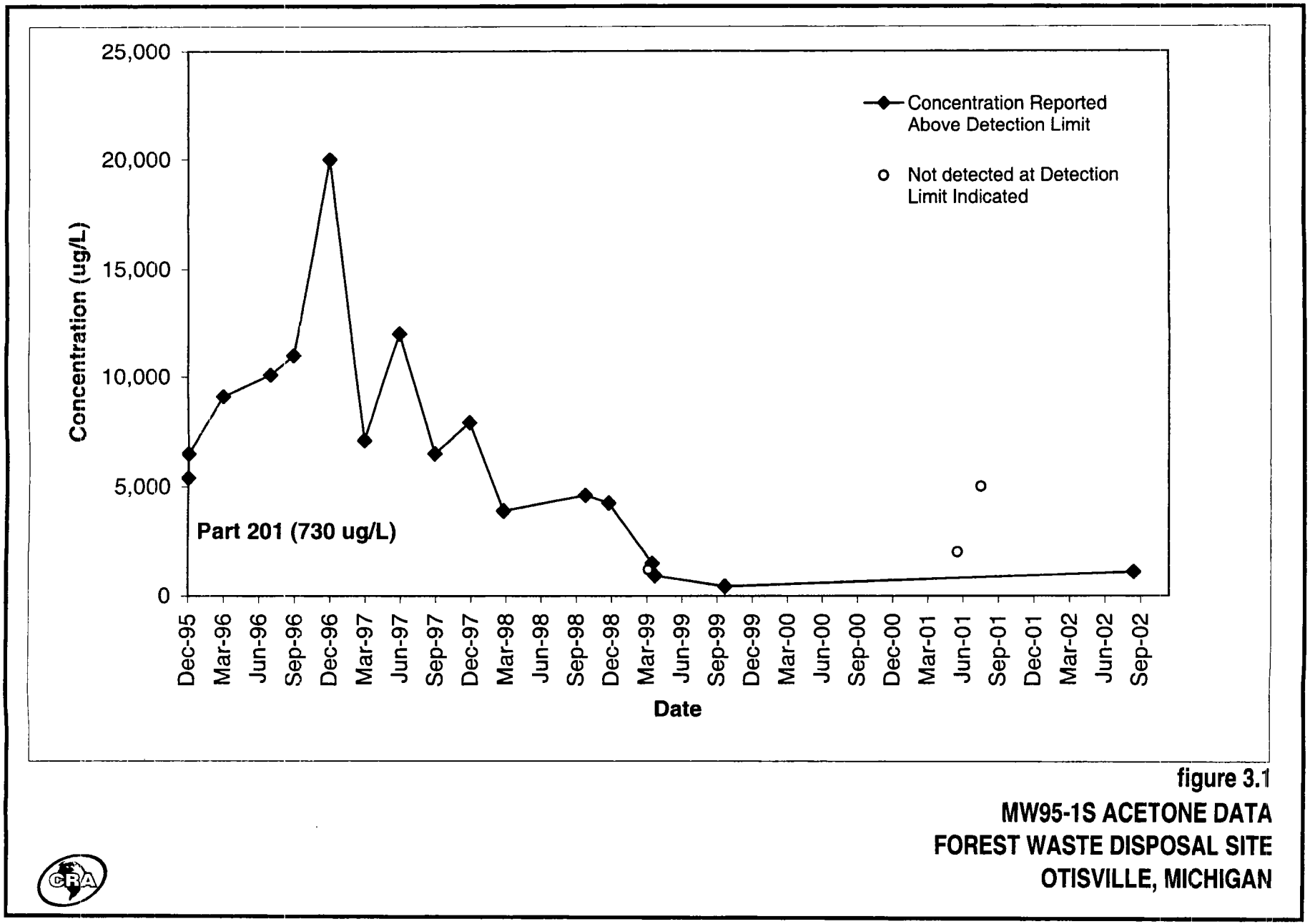


figure 3.1

MW95-1S ACETONE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

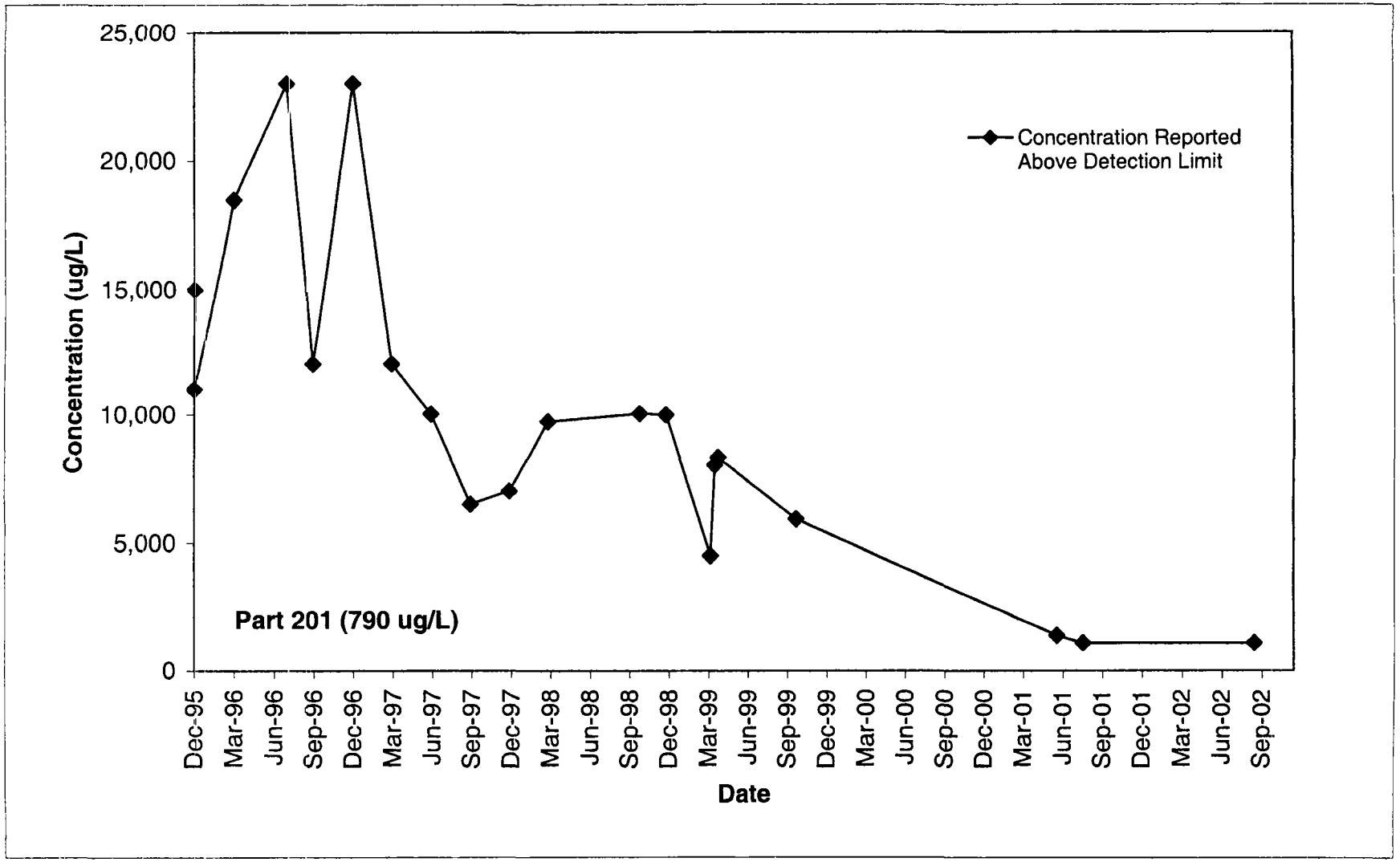


figure 3.2
MW95-1S TOLUENE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

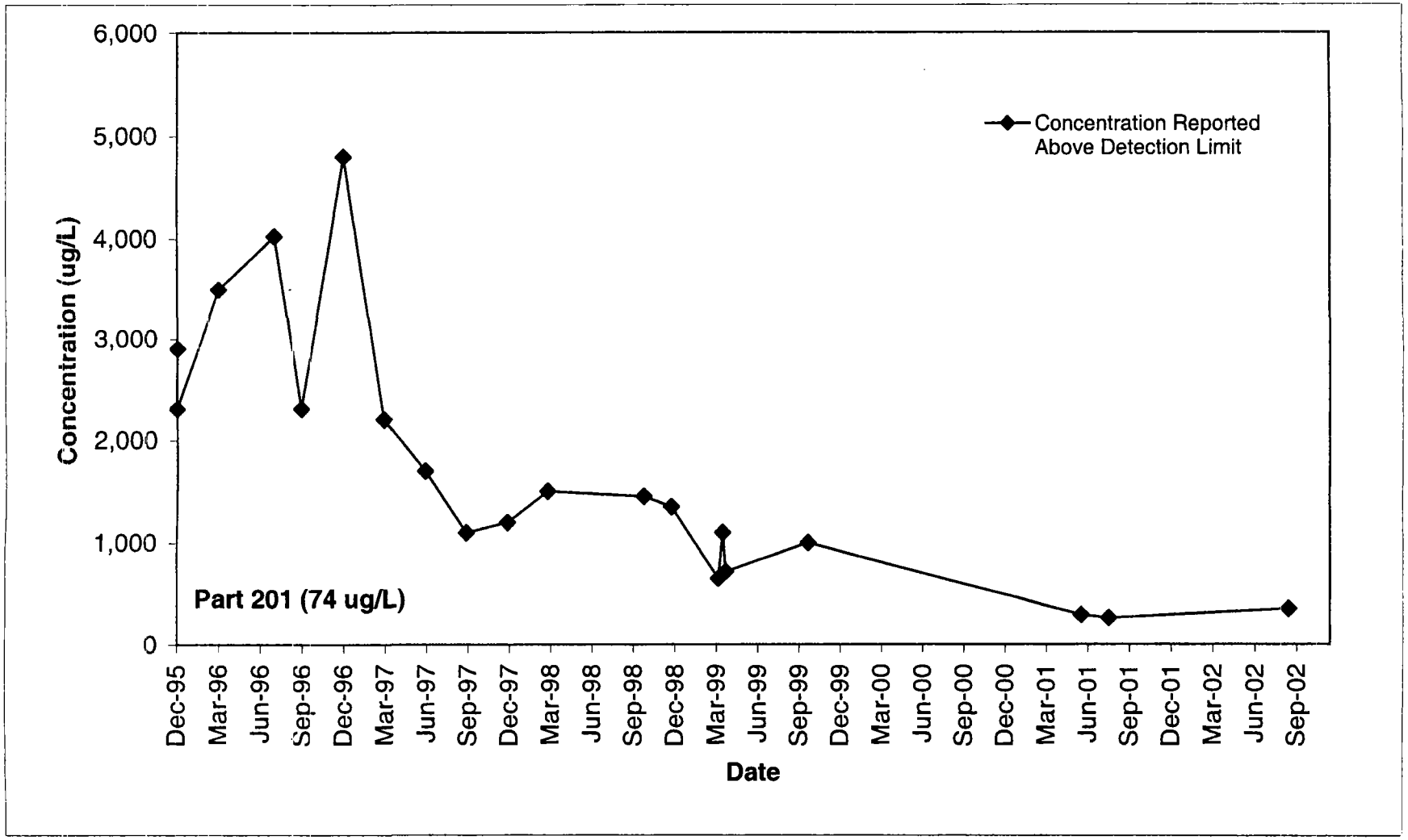


figure 3.3
MW95-1S ETHYLBENZENE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

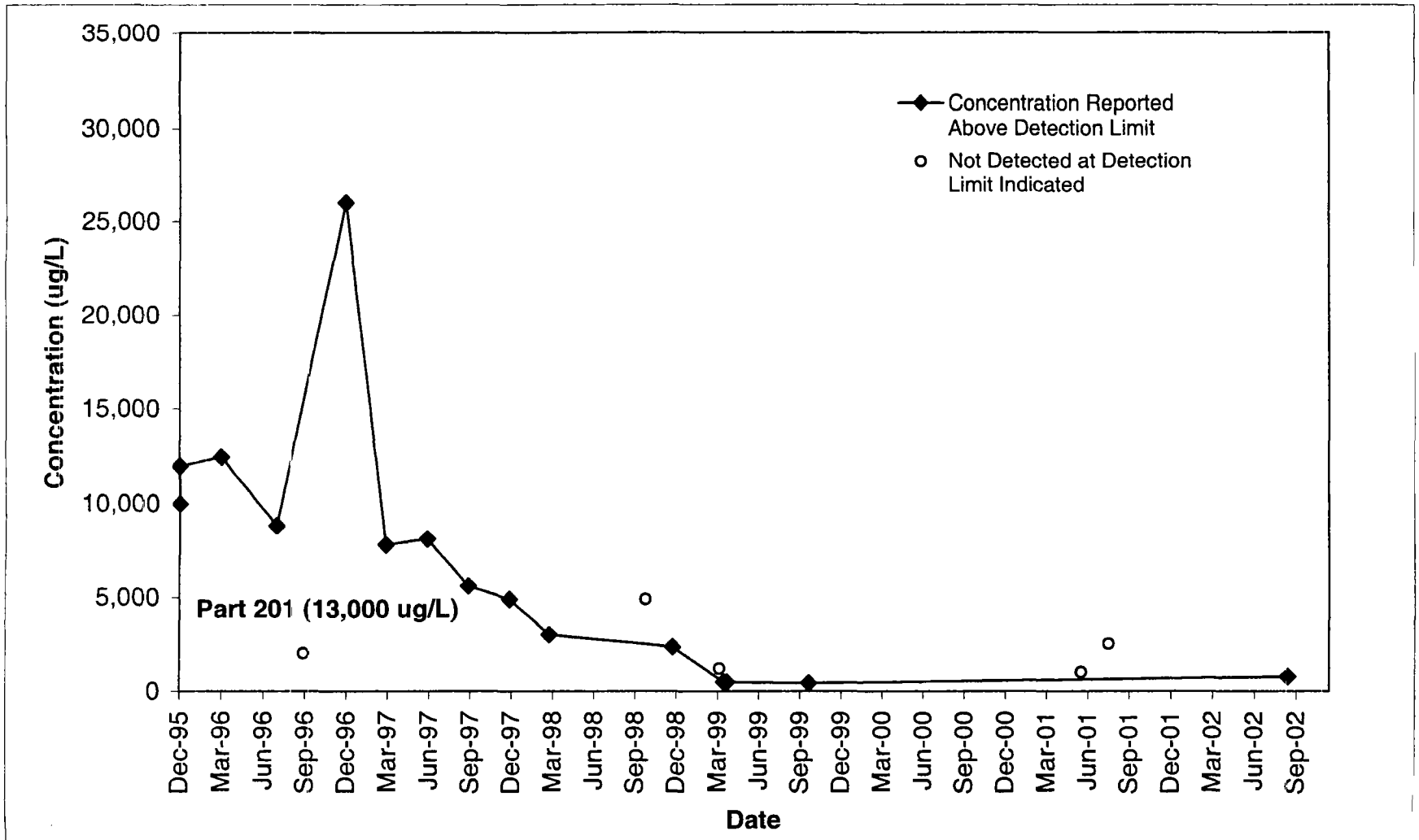


figure 3.4
MW95-1S MEK (2-BUTANONE) DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

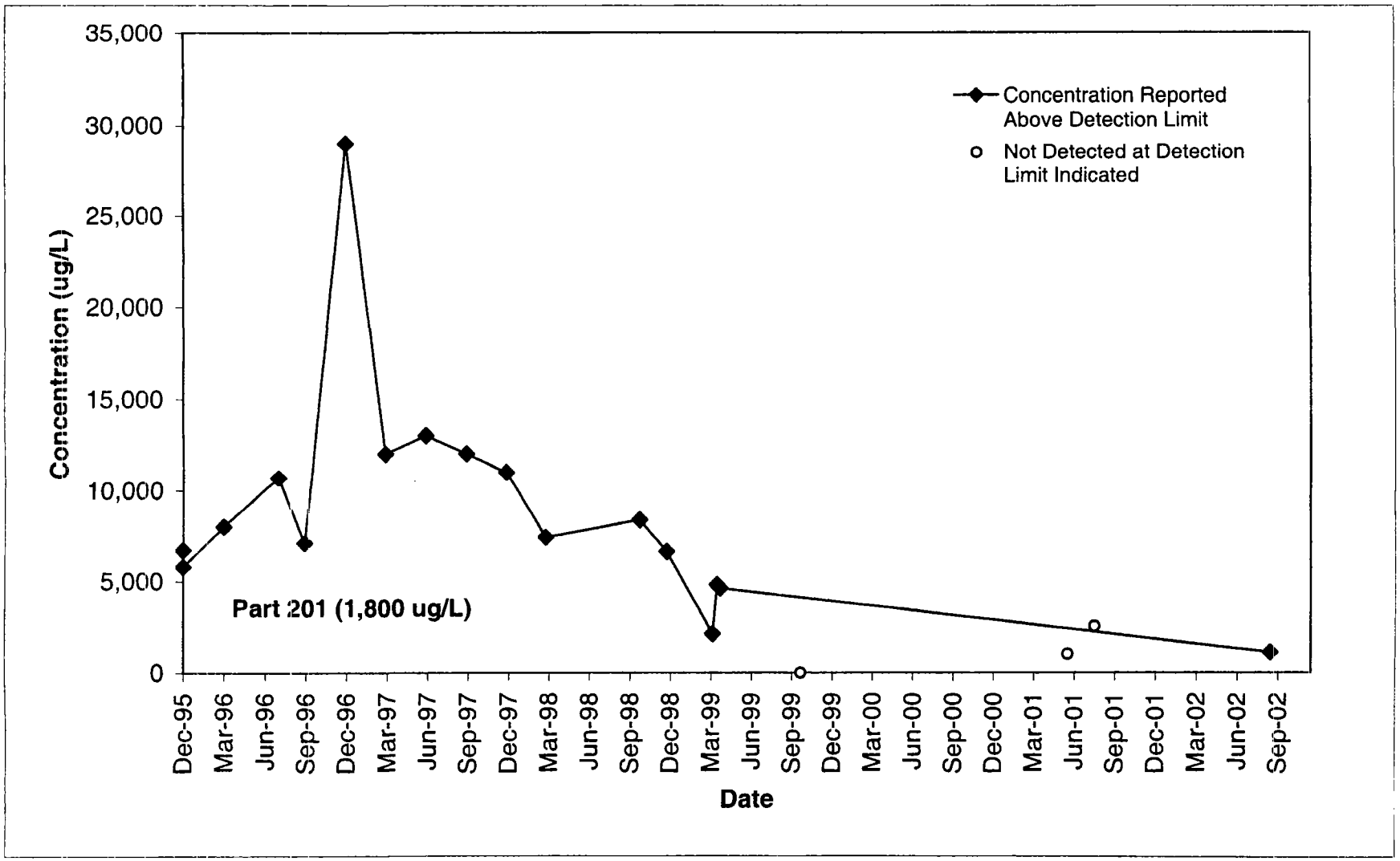


figure 3.5

MW95-1S MIBK (4-METHYL-2-PENTANONE) DATA

FOREST WASTE DISPOSAL SITE

OTISVILLE, MICHIGAN

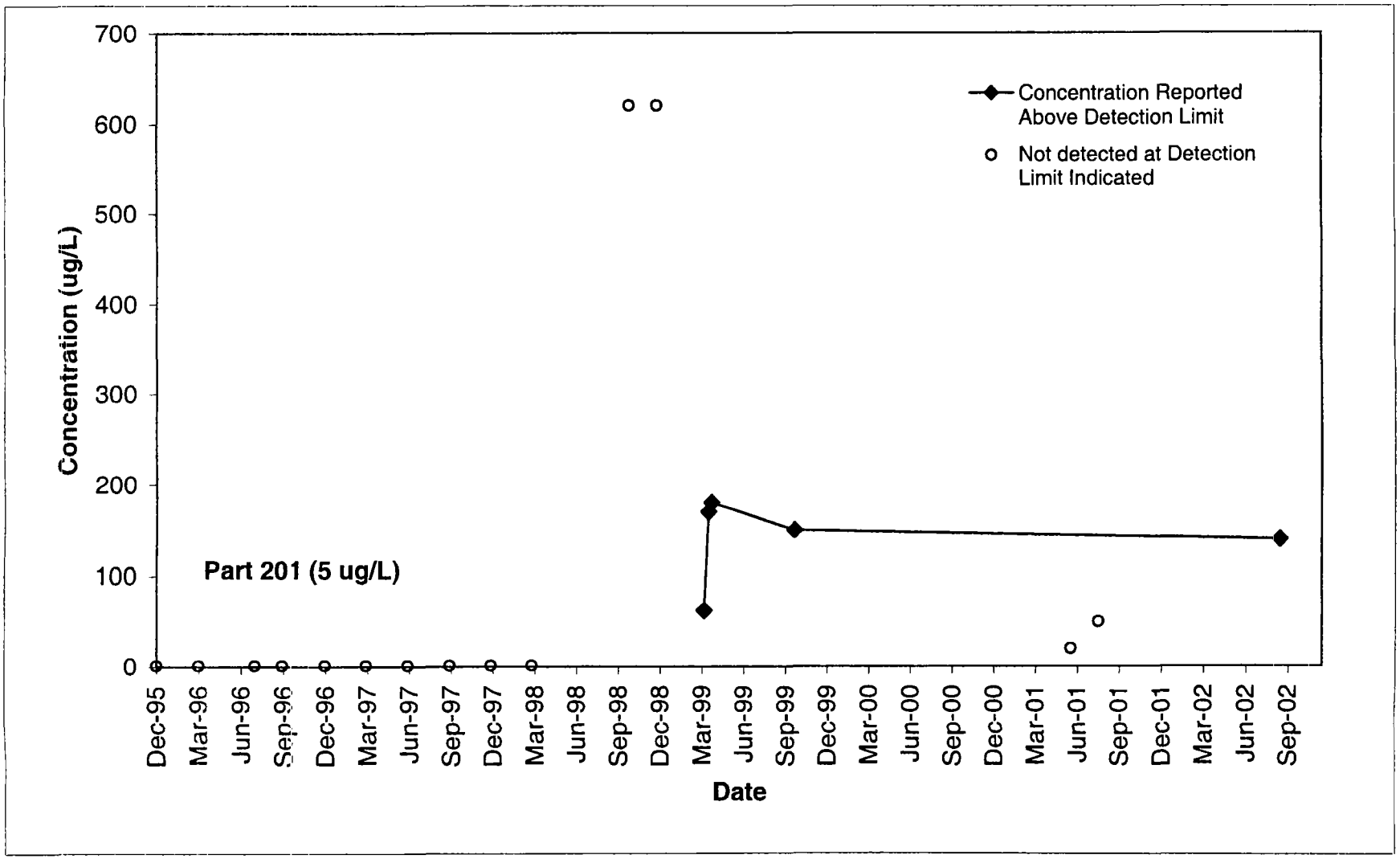


figure 3.6
MW95-1S BENZENE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

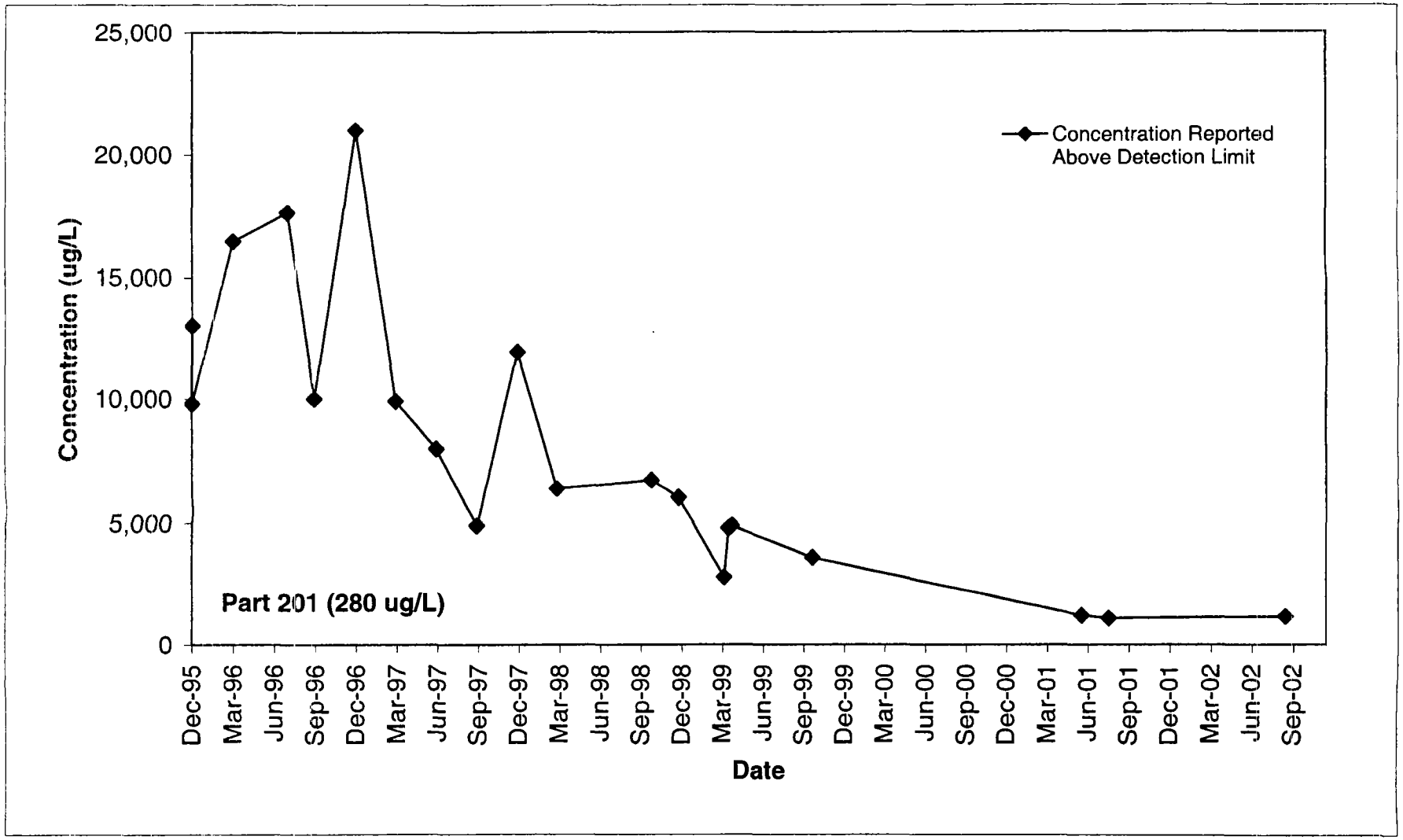


figure 3.7
MW95-1S XYLENE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

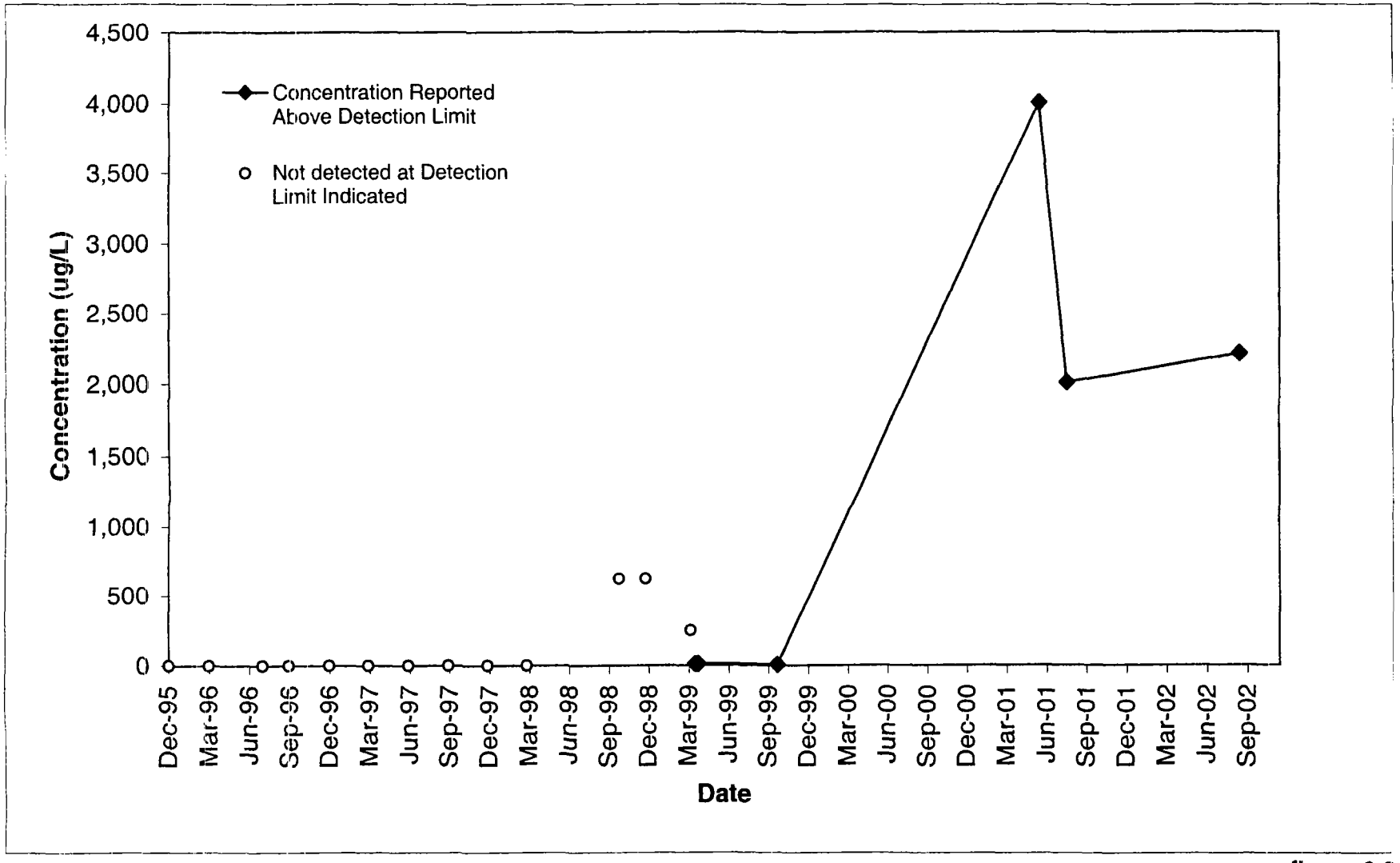


figure 3.8

MW95-1S 1,2-DICHLOROETHENE (CIS- & TRANS-) DATA

FOREST WASTE DISPOSAL SITE

OTISVILLE, MICHIGAN

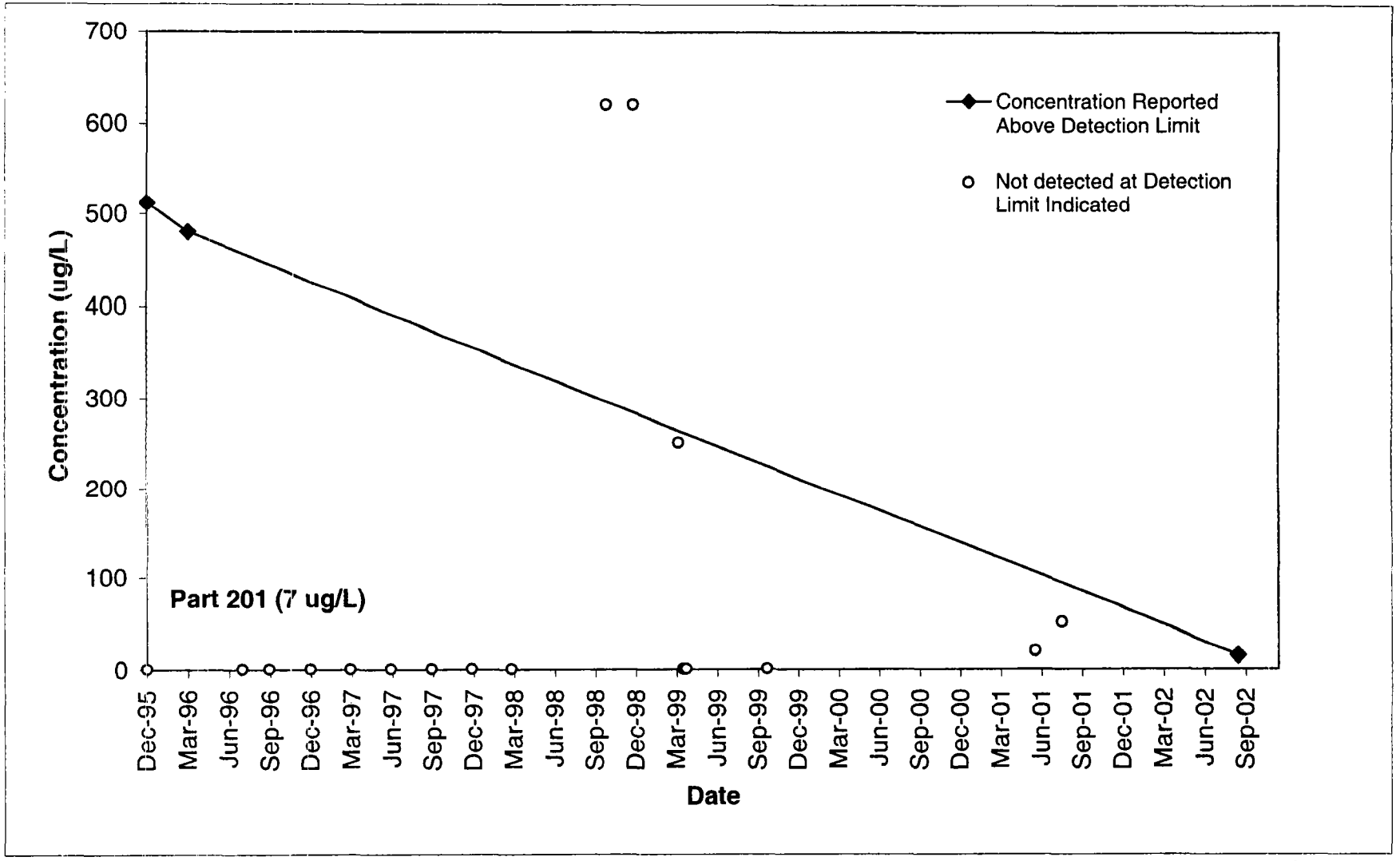


figure 3.9

MW95-1S 1,1-DICHLOROETHENE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

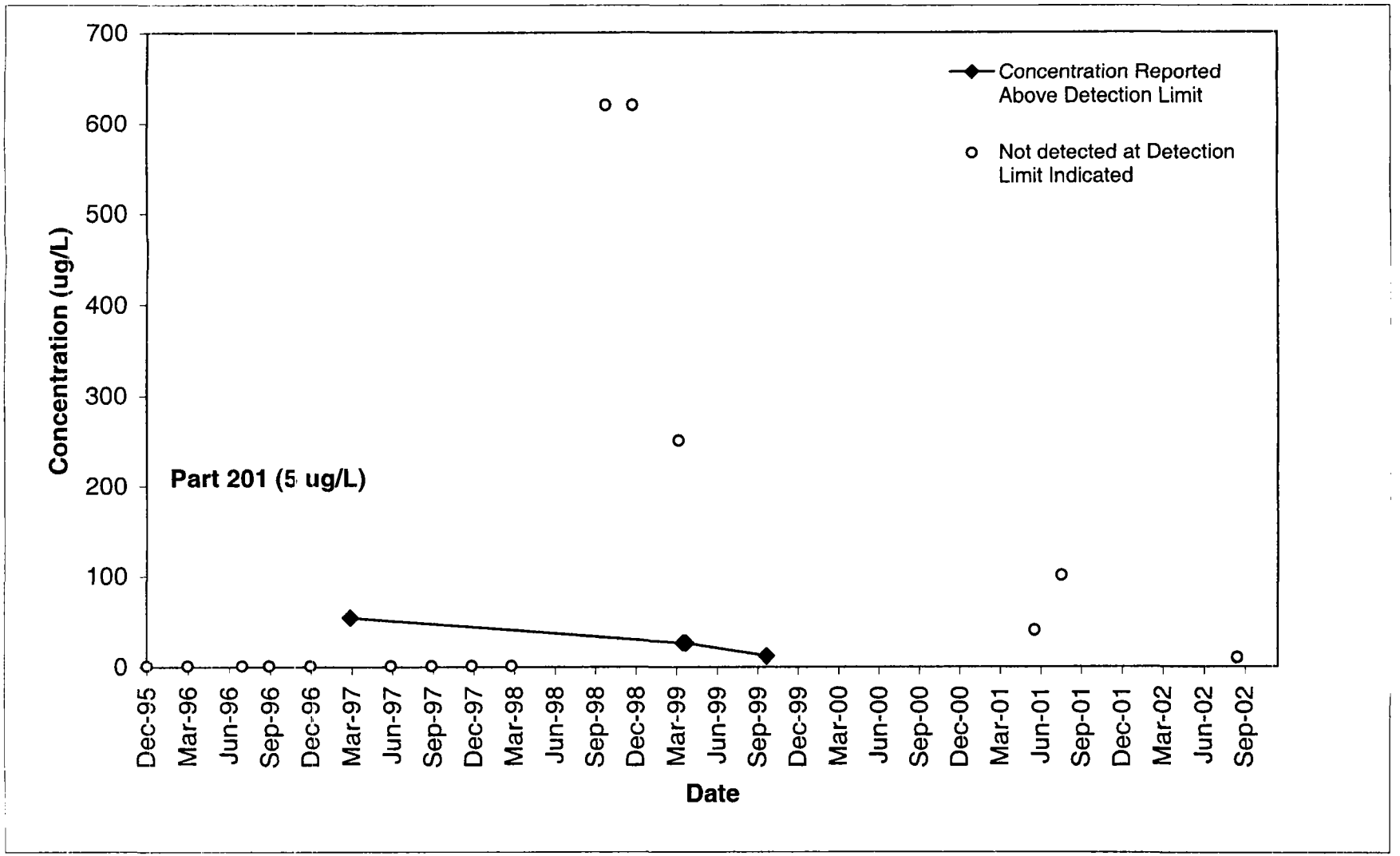


figure 3.10

MW95-1S TRICHLOROETHENE DATA

FOREST WASTE DISPOSAL SITE

OTISVILLE, MICHIGAN

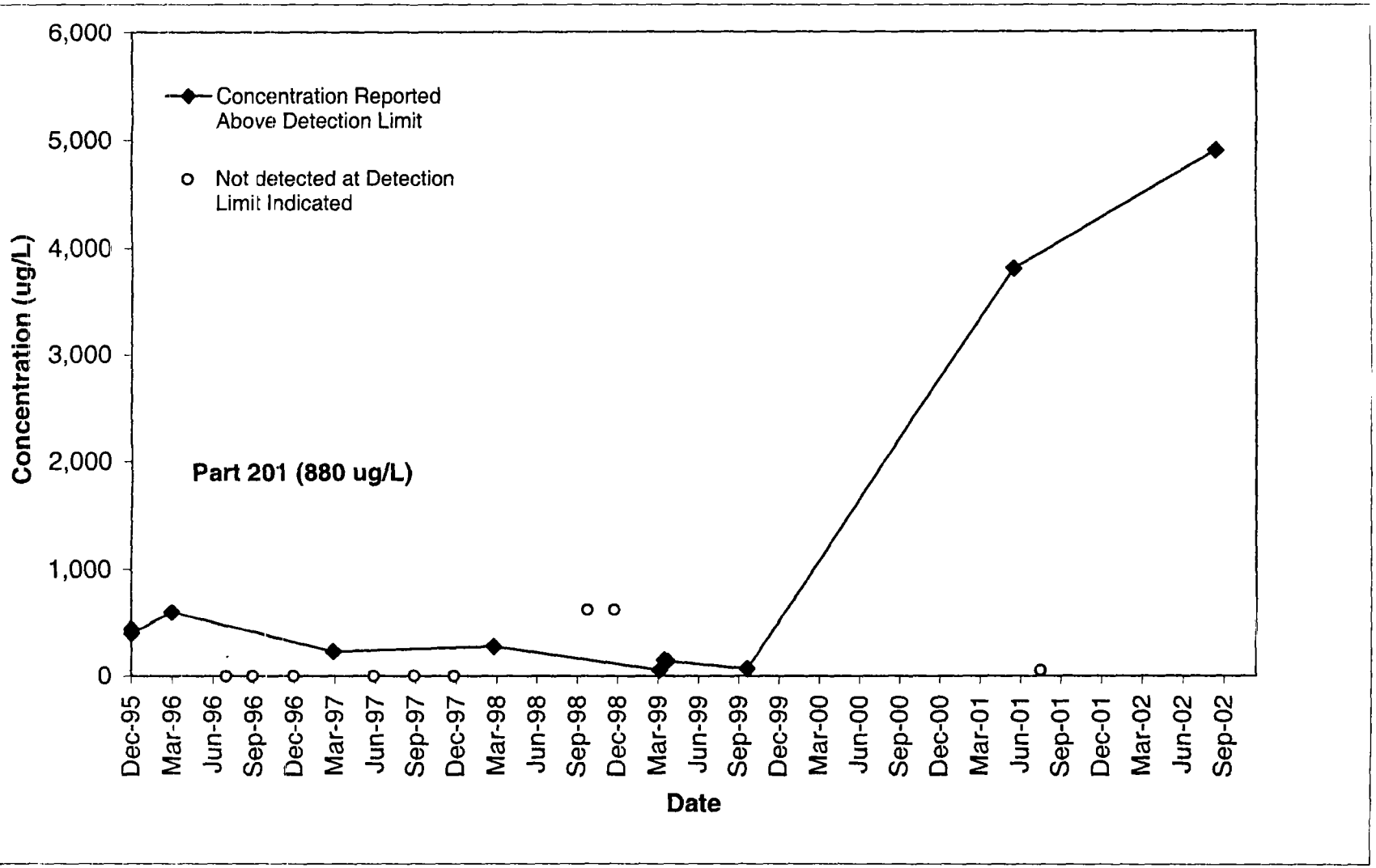


figure 3.11

MW95-1S 1,1-DICHLOROETHANE DATA

FOREST WASTE DISPOSAL SITE

OTISVILLE, MICHIGAN

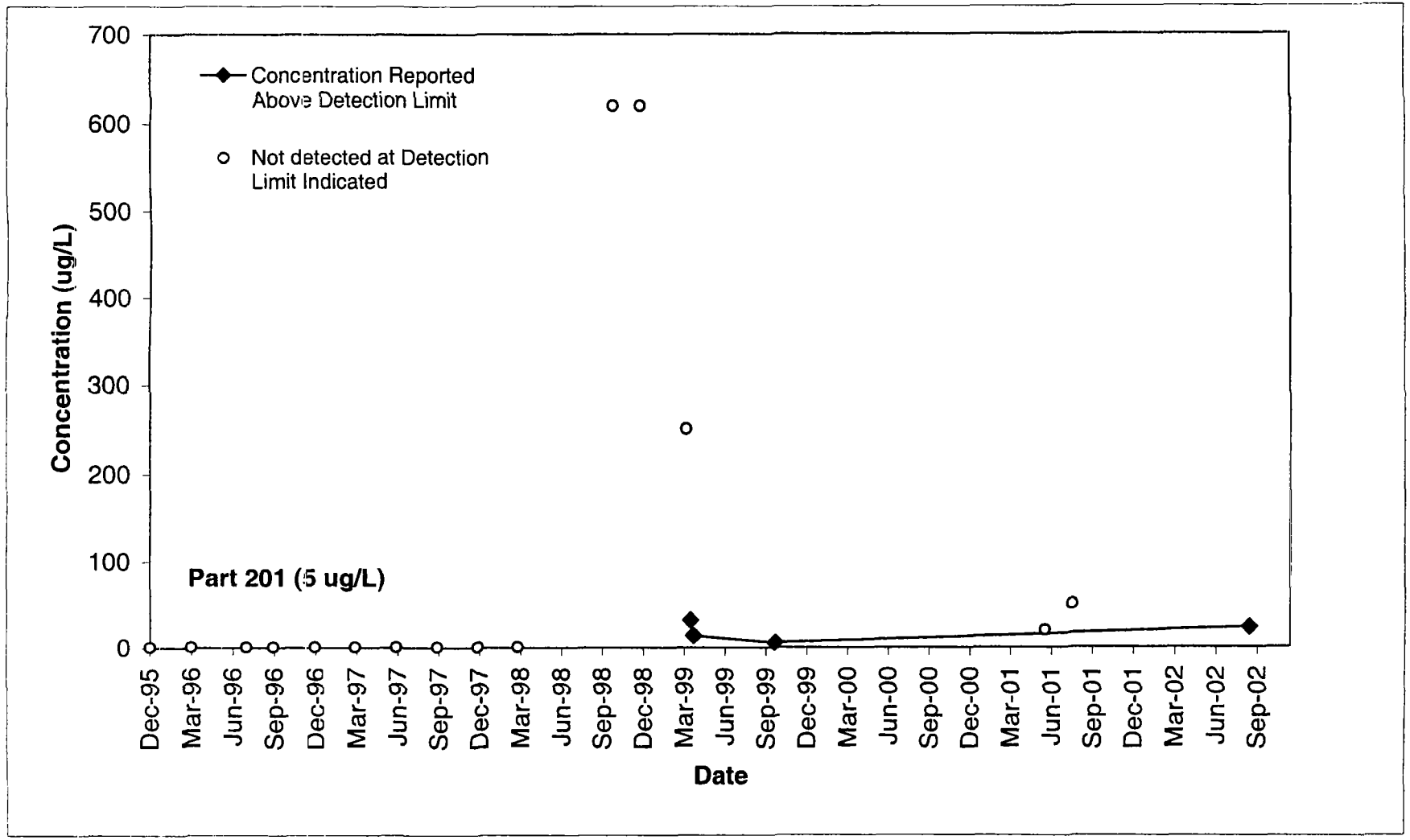


figure 3.12

MW95-1S 1,2-DICHLOROETHANE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

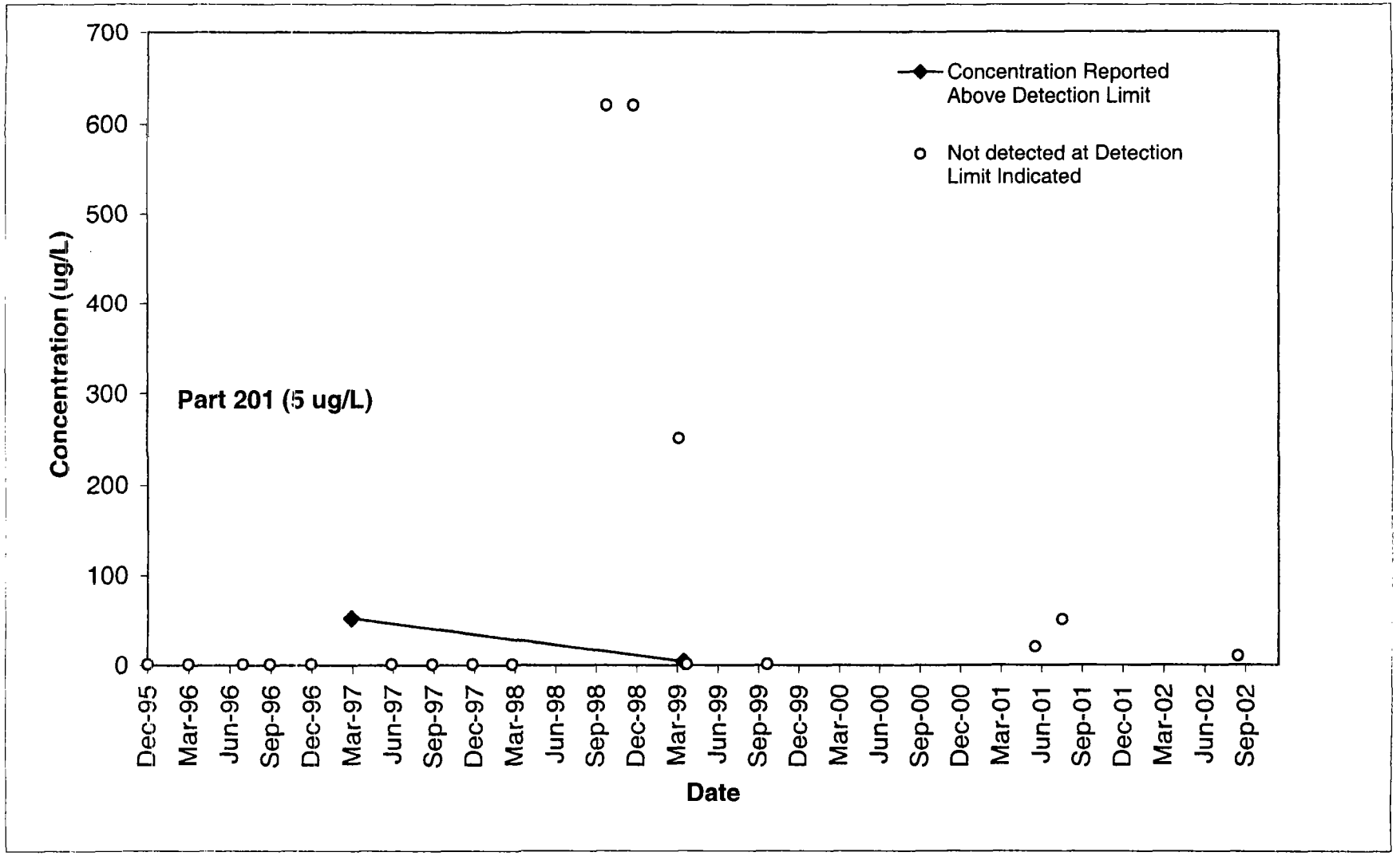


figure 3.13

MW95-1S 1,2-DICHLOROPROPANE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

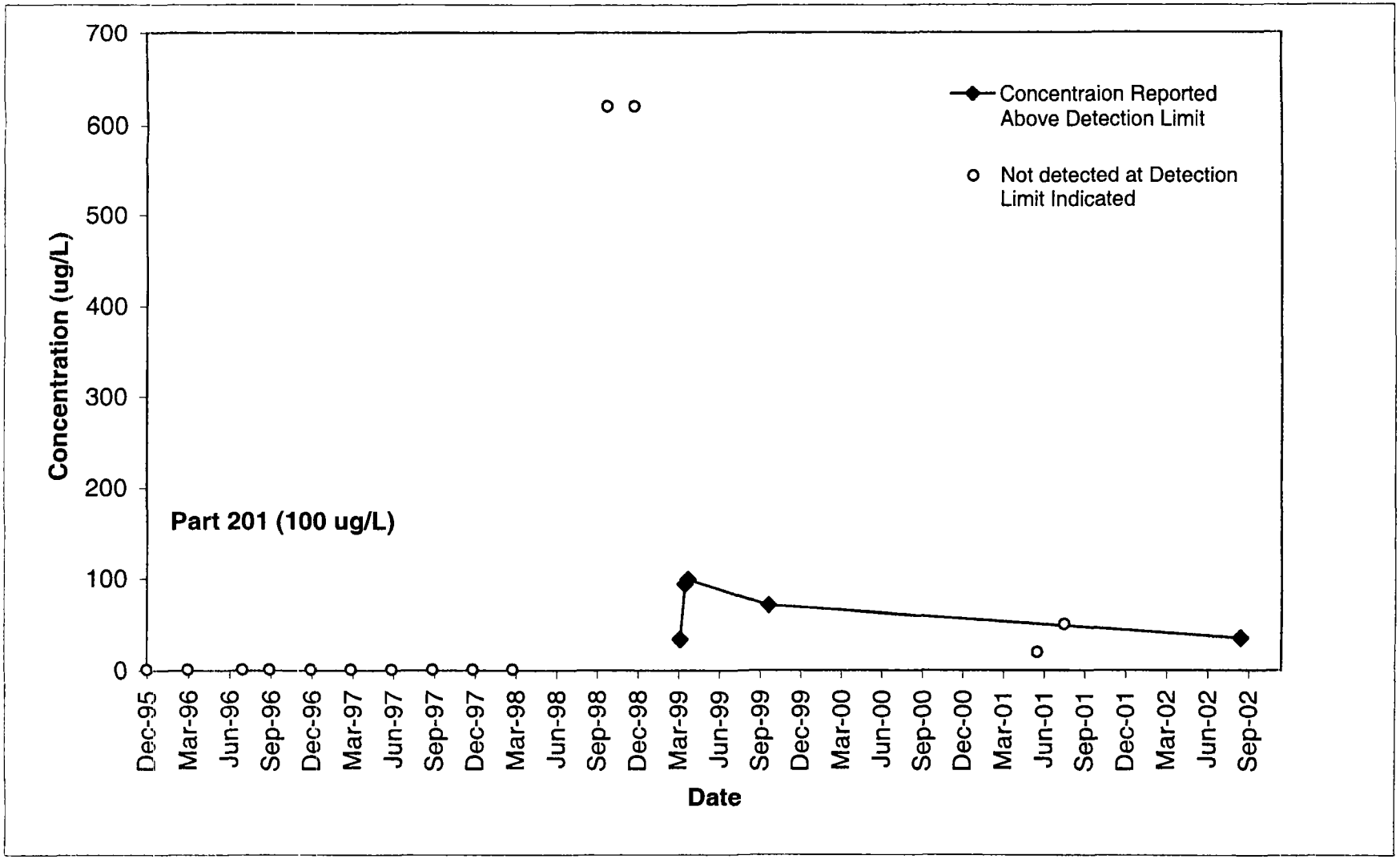


figure 3.14

MW95-1S CHLOROBENZENE DATA
FORREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

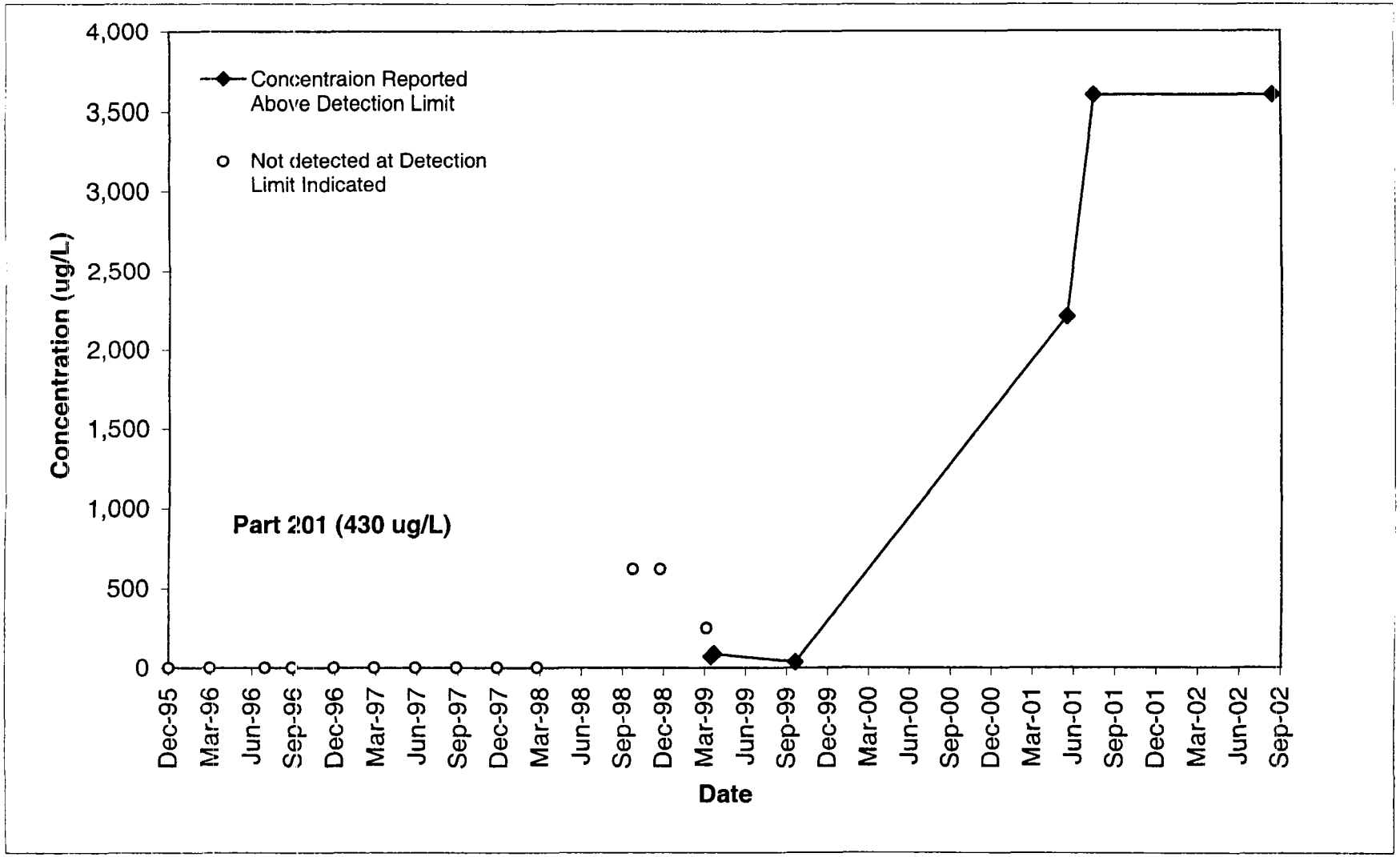


figure 3.15

MW95-1S CHLOROETHANE DATA

FOREST WASTE DISPOSAL SITE

OTISVILLE, MICHIGAN

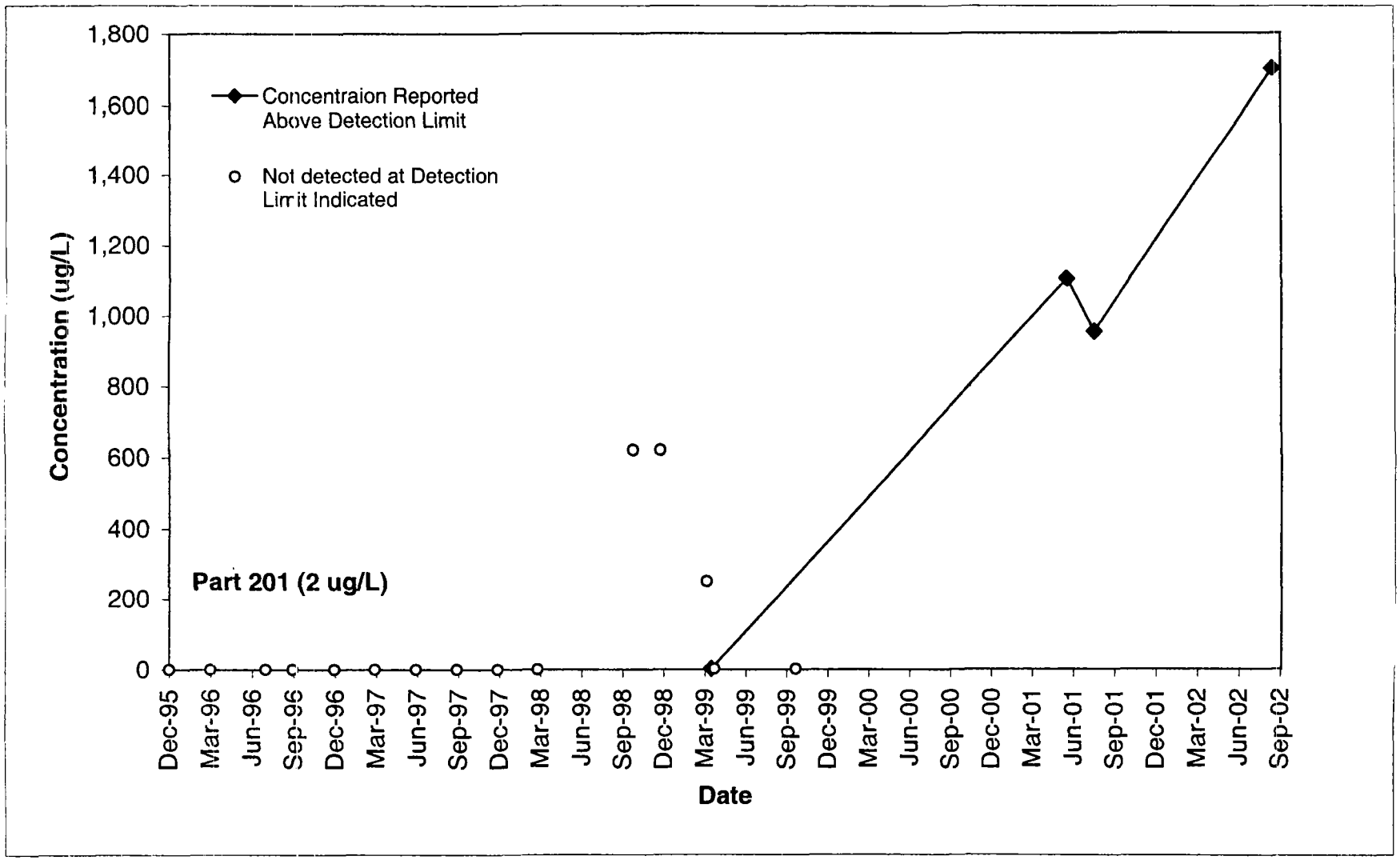


figure 3.16
MW95-1S VINYL CHLORIDE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

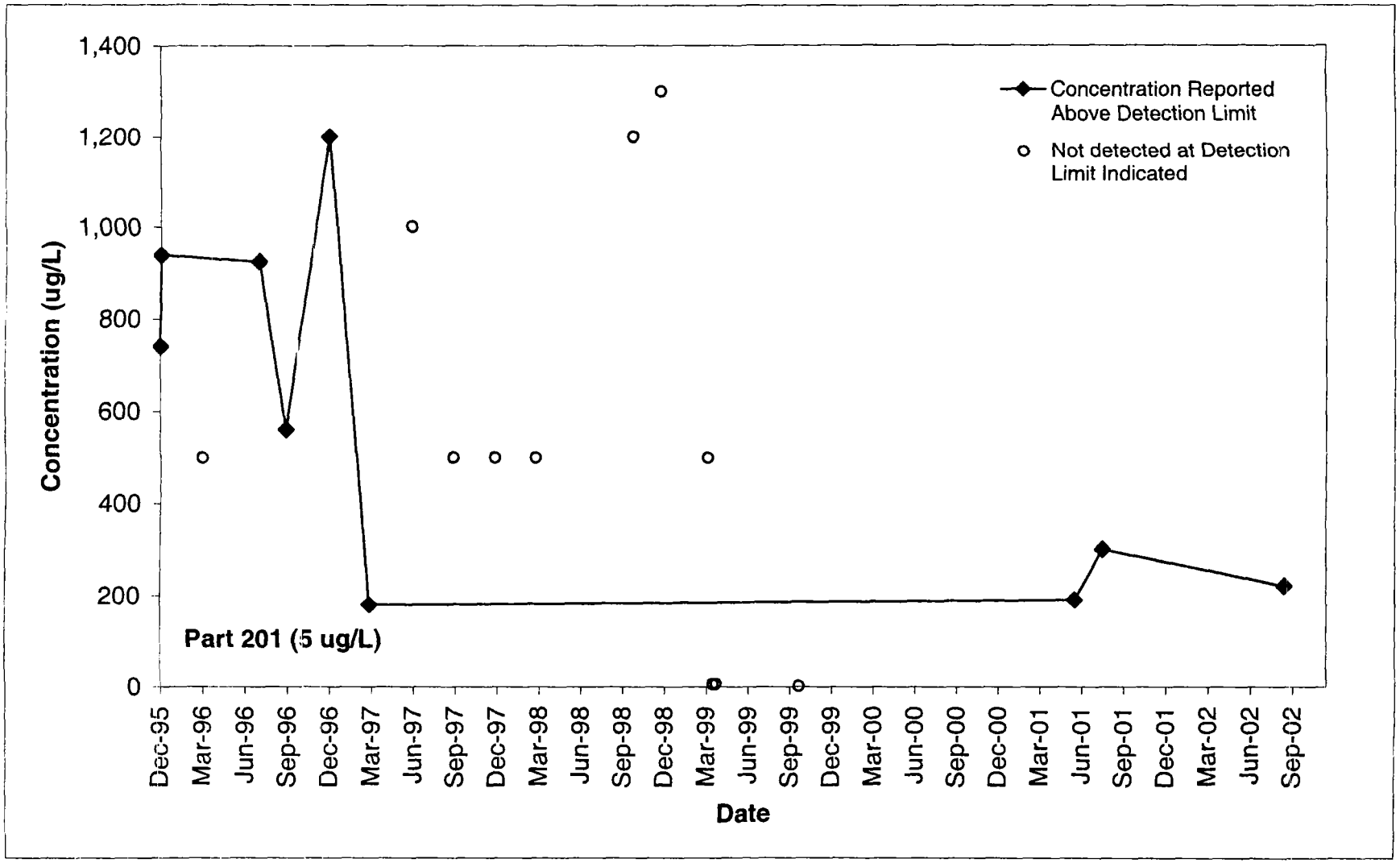


figure 3.17

MW95-1S METHYLENE CHLORIDE DATA
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

TABLES

TABLE 2.1

SUMMARY OF GROUNDWATER ELEVATIONS
2002 INTERIM GROUNDWATER MONITORING EVENT
FOREST WASTE SITE
OTISVILLE, MICHIGAN

	Monitor	*Top of Casing Elevation (feet AMSL)*	*Depth to Water From Top of Casing (feet)*	*Groundwater Elevation (feet AMSL)*
Shallow Wells	MW84-1S	826.60	20.58	806.02
	MW84-2S	826.27	21.43	804.84
	MW84-4S	821.83	17.32	804.51
	MW84-5S	831.52	25.50	806.02
	MW84-6S	829.73	23.50	806.23
	MW86-6S	827.69	26.65	801.04
	MW90-3S	823.53	17.25	806.28
	MW90-4S	823.39	18.40	804.99
	MW95-1S	826.19	21.61	804.58
	MW95-2S	827.69	21.60	806.09
	MW99-1S	826.96	22.35	804.61
	MW99-2S	816.24	12.15	804.09
	MW99-3S	815.21	10.71	804.50
	MW99-4	820.26	16.21	804.05
	MW99-4S	820.16	15.95	804.21
	MW99-5S	812.67	14.02	798.65
	MW99-8S	821.56	17.02	804.54
	MW99-9S	830.58	27.89	802.69
	MW99-10S	802.34	4.49	797.85
	MW99-11S	801.48	3.40	798.08
	MW99-12S	821.15	23.03	798.12
	PZ99-1	804.41	6.42	797.99
	MW00-21S	823.07	30.68	792.39
	MW01-24S	802.15	7.22	794.93
	MW01-25S	814.97	10.56	804.41
	MW01-26S	823.11	24.31	798.80
	MW01-30S	828.73	28.34	800.39
	MW02-31S	804.23	7.26	796.97
	staff-2001	799.64	1.36	798.28
	BH02-01	824.09	32.71	791.38
	BH02-02	820.68	23.55	797.13
	BH02-03	805.16	10.33	794.83
	BH02-04	804.17	7.62	796.55
	BH02-05	808.02	10.69	797.33
	BH02-06	807.80	15.38	792.42
	BH02-07	808.34	12.69	795.65
	MW02-33S	804.51	10.77	793.74

TABLE 2.1

SUMMARY OF GROUNDWATER ELEVATIONS
2002 INTERIM GROUNDWATER MONITORING EVENT
FOREST WASTE SITE
OTISVILLE, MICHIGAN

	Monitor	*Top of Casing Elevation (feet AMSL)*	*Depth to Water From Top of Casing (feet)*	*Groundwater Elevation (feet AMSL)*
Deep Wells	MW95-1D	825.82	34.09	791.73
	MW95-2D	827.89	35.51	792.38
	MW99-13D	828.90	37.34	791.56
	MW99-14D	832.38	40.78	791.60
	MW99-15D	830.78	39.15	791.63
	MW99-16D	814.97	23.37	791.60
	MW99-18D	835.43	43.92	791.51
	MW99-5D	812.25	20.64	791.61
	MW99-6D	815.50	24.06	791.44
	MW99-7D	814.88	23.37	791.51
	MW00-19D	834.23	42.56	791.67
	MW00-20D	829.41	37.94	791.47
	MW00-22D	822.18	30.82	791.36
	MW00-23D	820.75	29.87	790.88
	MW01-27D	823.06	31.94	791.12
	MW01-28D	821.52	30.35	791.17
	MW01-29D	835.00	43.85	791.15
	MW02-33D	823.75	32.74	791.01
	MW02-34D	822.30	31.33	790.97
	BH02-09	816.93	26.05	790.88
	BH02-10	833.39	42.51	790.88
	BH02-19	812.27	21.50	790.77

MONITORING WELL FIELD PARAMETER DATA
2002 INTERIM GROUNDWATER MONITORING REPORT
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

Monitoring Well ID	*Sample Date*	*Depth to Well Bottom (feet BTOR)*	*Depth to Static Water (feet BTOR)*	*Water Column Height (feet)*	*Equivalent Well Volume (gallons)*	*rate (gal/min)*	*Cumulative Volume Purged (gallons)*	*pH*	*Temperature (^{0}C)*	*Specific Conductance (mS/cm)*	*Turbidity (NTU)*
MW84-1S	18-Sep-02	NM	20.58	NM	NM	0.33	1.6	7.04	17.1	0.647	<1.0
						0.33	1.7	7.05	16.3	0.652	<1.0
						0.33	1.8	7.05	16.3	0.658	<1.0
						0.33	2.0	7.05	17.1	0.662	<1.0
						0.33	2.1	7.05	16.3	0.664	<1.0
						0.33	2.2	7.04	17.0	0.665	<1.0
MW84-4S	18-Sep-02	NM	17.32	NM	NM	0.33	0.1	7.17	14.3	0.645	<1.0
						0.33	0.2	6.70	14.8	1.025	<1.0
						0.33	0.3	6.67	15.0	1.031	<1.0
						0.33	0.4	6.69	15.0	1.036	<1.0
MW84-5S	19-Sep-02	32.50	25.50	7.00	1.12	0.33	0.4	7.15	13.3	0.664	6.3
						0.33	0.8	7.10	13.5	0.664	<1.0
						0.33	0.9	7.11	13.6	0.666	1.2
						0.33	1.0	7.07	13.7	0.677	<1.0
						0.33	1.2	7.06	13.8	0.667	<1.0
						0.33	1.3	7.10	13.7	0.663	<1.0
						0.33	1.4	7.09	13.7	0.664	<1.0
MW84-6S	18-Sep-02	NM	23.50	NM	NM	0.33	0.3	7.18	20.3	0.549	11.8
						0.33	0.4	7.15	17.7	0.553	10.5
						0.33	0.5	7.15	17.0	0.557	8.3
						0.33	0.7	7.16	16.8	0.561	8.3
						0.33	0.7	7.20	17.1	0.568	6.6
						0.33	1.2	7.19	16.3	0.571	6.5
						0.33	1.4	7.20	15.5	0.573	6.5

MONITORING WELL FIELD PARAMETER DATA
2002 INTERIM GROUNDWATER MONITORING REPORT
FOREST WASTE DISPOSAL SITE
OTISVILLE, MICHIGAN

Monitoring Well ID	*Sample Date*	*Depth to Well Bottom (feet BTOR)*	*Depth to Static Water (feet BTOR)*	*Water Column Height (feet)*	*Equivalent Well Volume (gallons)*	*Purge Rate (gal/min)*	*Cumulative Volume Purged (gallons)*	*pH*	*Temperature (^{0}C)*	*Specific Conductance (mS/cm)*	*Turbidity (NTU)*
MW86-6S	19-Sep-02	29.88	26.50	3.38	0.54	0.03	0.5	7.00	15.8	0.704	105.2
						0.03	0.8	6.96	16.4	0.795	118.7
						0.03	1.0	6.93	16.2	0.875	79.1
						0.03	1.3	6.81	17.2	1.071	55.8
						0.03	1.6	6.60	17.6	1.125	55.1
						0.03	1.7	6.76	17.8	1.126	37.8
						0.03	1.8	6.77	17.8	1.124	16.3
						0.03	2.0	6.76	18.0	1.126	16.4
						0.03	2.1	6.78	18.1	1.125	16.4
MW90-3S	19-Sep-02	25.72	17.25	8.47	1.36	0.03	0.1	7.13	22.7	0.717	14.0
						0.03	0.3	7.06	23.6	0.712	6.0
						0.03	0.4	7.05	25.8	0.710	2.1
						0.03	0.5	7.04	26.6	0.710	2.1
						0.03	0.7	7.04	26.5	0.711	2.0
MW90-4S	18-Sep-02	25.01	18.40	6.61	1.06	0.03	0.0	6.87	14.1	0.793	4.2
						0.03	0.3	6.84	13.9	0.780	2.8
						0.03	0.4	6.87	13.6	0.785	2.4
						0.03	0.5	6.86	13.7	0.781	2.4
						0.03	0.8	6.87	13.4	0.776	2.3
MW95-1S	17-Sep-02	NM	21.61	NM	NM	0.03	0.1	7.14	15.0	1.372	3.2
						0.03	0.2	7.12	14.6	1.370	3.1
						0.03	0.3	7.11	14.4	1.369	2.9
						0.03	0.4	7.10	14.3	1.368	3.0
						0.03	7.5	7.10	14.2	1.365	3.0
MW95-2S	17-Sep-02	33.80	21.60	12.20	1.95	0.03	0.1	7.37	13.8	0.522	1.5
						0.03	0.3	7.29	13.2	0.514	1.5
						0.03	0.4	7.24	13.1	0.517	<1.0
						0.03	0.5	7.28	12.9	0.514	<1.0
						0.03	0.7	7.29	12.9	0.513	<1.0

TABLE 2.3

ANALYTICAL RESULTS SUMMARY - VOLATILES
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW84-1S*	*MW84-4S*	*MW84-5S*	*MW84-5S*	*MW84-6S*	*MW86-6S*
Sample ID:			*GW-12210-091802-BW-024*	*GW-12210-091802-BW-022*	*GW-12210-091902-BW-029*	*GW-12210-091902-BW-030*	*GW-12210-091802-BW-027*	*GW-12210-091902-BW-031*
Sample Date:			*9/18/2002*	*9/18/2002*	*9/19/2002*	*9/19/2002*	*9/18/2002*	*9/19/2002*
						Duplicate		
Parameter	*Units*	*Part 201 DWC*						
Volatiles								
1,1,1-Trichloroethane	µg/L	200	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2,2-Tetrachloroethane	µg/L	8.5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2-Trichloroethane	µg/L	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethane	µg/L	880	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethene	µg/L	7	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloroethane	µg/L	5	8	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloroethene (total)	µg/L	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
1,2-Dichloropropane	µg/L	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
2-Butanone (Methyl Ethyl Ketone)	µg/L	13000	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
2-Hexanone	µg/L	1000	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Methyl-2-pentanone	µg/L	1800	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
Acetone	µg/L	730	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)
Benzene	µg/L	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromodichloromethane	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromoform	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromomethane (Methyl Bromide)	µg/L	10	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Carbon disulfide	µg/L	800	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Carbon tetrachloride	µg/L	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chlorobenzene	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroethane	µg/L	430	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Chloroform (Trichloromethane)	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloromethane (Methyl Chloride)	µg/L	260	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
cis-1,2-Dichloroethene	µg/L	70	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,3-Dichloropropene	µg/L	-	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Dibromochloromethane	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Ethylbenzene	µg/L	74	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
m&p-Xylene	µg/L	-	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Methylene chloride	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
o-Xylene	µg/L	280	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Styrene	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Tetrachloroethene	µg/L	5	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)
Toluene	µg/L	790	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,2-Dichloroethene	µg/L	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,3-Dichloropropene	µg/L	-	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Trichloroethene	µg/L	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl chloride	µg/L	2	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Xylene (total)	µg/L	280	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)	ND (3)

Notes:

ND - Non-detect at associated value.
[ ] - Exceeds Part 201 Drinking Water Criteria.

TABLE 2.3

ANALYTICAL RESULTS SUMMARY - VOLATILES
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW90-3S*	*MW90-4S*	*MW90-4S*	*MW95-1S*	*MW95-2S*
Sample ID:			*GW-12210-091902-BW-037*	*GW-12210-091802-BW-020*	*GW-12210-091802-BW-021*	*GW-12210-091702-BW-011*	*GW-12210-091702-BW-019*
Sample Date:			*9/19/2002*	*9/18/2002*	*9/18/2002 Duplicate*	*9/17/2002*	*9/17/2002*
Parameter	*Units*	*Part 201 DWC*					
Volatiles							
1,1,1-Trichloroethane	µg/L	200	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
1,1,2,2-Tetrachloroethane	µg/L	8.5	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
1,1,2-Trichloroethane	µg/L	5	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
1,1-Dichloroethane	µg/L	880	ND (1)	ND (1)	ND (1)	**4900**	ND (1)
1,1-Dichloroethene	µg/L	7	ND (1)	ND (1)	ND (1)	**15**	ND (1)
1,2-Dichloroethane	µg/L	5	ND (1)	ND (1)	ND (1)	**23**	ND (1)
1,2-Dichloroethene (total)	µg/L	-	ND (2)	ND (2)	ND (2)	2200	ND (2)
1,2-Dichloropropane	µg/L	5	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
2-Butanone (Methyl Ethyl Ketone)	µg/L	13000	ND (10)	ND (10)	ND (10)	760	ND (10)
2-Hexanone	µg/L	1000	ND (5)	ND (5)	ND (5)	ND (50)	ND (5)
4-Methyl-2-pentanone	µg/L	1800	ND (10)	ND (10)	ND (10)	830	ND (10)
Acetone	µg/L	730	ND (50)	ND (50)	ND (50)	**1100**	ND (50)
Benzene	µg/L	5	ND (1)	ND (1)	ND (1)	**140**	ND (1)
Bromodichloromethane	µg/L	100	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Bromoform	µg/L	100	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Bromomethane (Methyl Bromide)	µg/L	10	ND (3)	ND (3)	ND (3)	ND (30)	ND (3)
Carbon disulfide	µg/L	800	ND (5)	ND (5)	ND (5)	ND (50)	ND (5)
Carbon tetrachloride	µg/L	5	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Chlorobenzene	µg/L	100	ND (1)	ND (1)	ND (1)	35	ND (1)
Chloroethane	µg/L	430	ND (2)	ND (2)	ND (2)	**3600**	ND (2)
Chloroform (Trichloromethane)	µg/L	100	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Chloromethane (Methyl Chloride)	µg/L	260	ND (2)	ND (2)	ND (2)	ND (20)	ND (2)
cis-1,2-Dichloroethene	µg/L	70	ND (1)	ND (1)	ND (1)	**2200**	ND (1)
cis-1,3-Dichloropropene	µg/L	-	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Dibromochloromethane	µg/L	100	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Ethylbenzene	µg/L	74	ND (1)	ND (1)	ND (1)	**350**	ND (1)
m&p-Xylene	µg/L	-	ND (2)	ND (2)	ND (2)	840	ND (2)
Methylene chloride	µg/L	5	ND (5)	ND (5)	ND (5)	**220**	ND (5)
o-Xylene	µg/L	280	ND (1)	ND (1)	ND (1)	**320**	ND (1)
Styrene	µg/L	100	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Tetrachloroethene	µg/L	5	ND (3)	ND (3)	ND (3)	ND (30)	ND (3)
Toluene	µg/L	790	ND (1)	2	2	**1100**	ND (1)
trans-1,2-Dichloroethene	µg/L	100	ND (1)	ND (1)	ND (1)	30	ND (1)
trans-1,3-Dichloropropene	µg/L	-	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Trichloroethene	µg/L	5	ND (1)	ND (1)	ND (1)	ND (10)	ND (1)
Vinyl chloride	µg/L	2	ND (2)	ND (2)	ND (2)	**1700**	ND (2)
Xylene (total)	µg/L	280	ND (3)	ND (3)	ND (3)	**1160**	ND (3)

Notes:

ND - Non-detect at associated value.
[ ] - Exceeds Part 201 Drinking Water Criteria.

TABLE 2.4

ANALYTICAL RESULTS SUMMARY - SEMI-VOLATILES
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW84-1S*	*MW84-4S*	*MW84-5S*	*MW84-5S*	*MW84-6S*
Sample ID:			*GW-12210-091802-BW-024*	*GW-12210-091802-BW-022*	*GW-12210-091902-BW-029*	*GW-12210-091902-BW-030*	*GW-12210-091802-BW-027*
Sample Date:			*9/18/2002*	*9/18/2002*	*9/19/2002*	*9/19/2002*	*9/18/2002*
						Duplicate	
Parameter	*Units*	*Part 201 DWC*					
Semi-Volatiles							
1,2,4-Trichlorobenzene	µg/L	70	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
1,2-Dichlorobenzene	µg/L	600	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,3-Dichlorobenzene	µg/L	6.6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,4-Dichlorobenzene	µg/L	75	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
2,2'-oxybis(1-Chloropropane) (bis(2-chloroisopropyl)ether)	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4,5-Trichlorophenol	µg/L	730	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4,6-Trichlorophenol	µg/L	120	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dichlorophenol	µg/L	73	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dimethylphenol	µg/L	370	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dinitrophenol	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
2,4-Dinitrotoluene	µg/L	7.7	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,6-Dinitrotoluene	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Chloronaphthalene	µg/L	1800	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Chlorophenol	µg/L	45	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Methylnaphthalene	µg/L	260	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Methylphenol	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
2-Nitrophenol	µg/L	20	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3&4-Methylphenol	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3,3'-Dichlorobenzidine	µg/L	1.1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4,6-Dinitro-2-methylphenol	µg/L	20	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4-Bromophenyl phenyl ether	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chloro-3-methylphenol	µg/L	150	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chloroaniline	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chlorophenyl phenyl ether	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4-Nitrophenol	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
Acenaphthene	µg/L	1300	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Acenaphthylene	µg/L	52	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Anthracene	µg/L	43	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(a)anthracene	µg/L	2.1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(a)pyrene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(b)fluoranthene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(g,h,i)perylene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(k)fluoranthene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Chloroethoxy)methane	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Chloroethyl)ether	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Ethylhexyl)phthalate	µg/L	6	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Butyl benzylphthalate	µg/L	1200	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Carbazole	µg/L	85	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Chrysene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dibenz(a,h)anthracene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dibenzofuran	µg/L	1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Diethyl phthalate	µg/L	5500	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dimethyl phthalate	µg/L	73000	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Di-n-butylphthalate	µg/L	880	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Di-n-octyl phthalate	µg/L	130	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Fluoranthene	µg/L	210	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Fluorene	µg/L	880	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorobenzene	µg/L	1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorobutadiene	µg/L	15	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorocyclopentadiene	µg/L	50	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachloroethane	µg/L	7.3	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Indeno(1,2,3-cd)pyrene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Isophorone	µg/L	770	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Naphthalene	µg/L	520	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Nitrobenzene	µg/L	3.4	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
N-Nitrosodi-n-propylamine	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
N-Nitrosodiphenylamine	µg/L	270	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Pentachlorophenol	µg/L	1	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
Phenanthrene	µg/L	52	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Phenol	µg/L	4400	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Pyrene	µg/L	140	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)

Note:

ND - Non-detect at associated value.

TABLE 2.4

ANALYTICAL RESULTS SUMMARY - SEMI-VOLATILES
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW86-6S*	*MW90-3S*	*MW90-4S*	*MW90-4S*	*MW95-2S*
Sample ID:			*GW-12210-091902-BW-031*	*GW-12210-091902-BW-037*	*GW-12210-091802-BW-020*	*GW-12210-091802-BW-021*	*GW-12210-091702-BW-019*
Sample Date:			*9/19/2002*	*9/19/2002*	*9/18/2002*	*9/18/2002*	*9/17/2002*
						Duplicate	
Parameter	*Units*	*Part 201 DWC*					
Semi-Volatiles							
1,2,4-Trichlorobenzene	µg/L	70	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
1,2-Dichlorobenzene	µg/L	600	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,3-Dichlorobenzene	µg/L	6.6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,4-Dichlorobenzene	µg/L	75	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
2,2'-oxybis(1-Chloropropane) (bis(2-chloroisopropyl)ether)	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4,5-Trichlorophenol	µg/L	730	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4,6-Trichlorophenol	µg/L	120	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dichlorophenol	µg/L	73	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dimethylphenol	µg/L	370	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,4-Dinitrophenol	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
2,4-Dinitrotoluene	µg/L	7.7	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2,6-Dinitrotoluene	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Chloronaphthalene	µg/L	1800	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Chlorophenol	µg/L	45	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Methylnaphthalene	µg/L	260	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Methylphenol	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
2-Nitrophenol	µg/L	20	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3&4-Methylphenol	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3,3'-Dichlorobenzidine	µg/L	1.1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
3-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4,6-Dinitro-2-methylphenol	µg/L	20	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4-Bromophenyl phenyl ether	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chloro-3-methylphenol	µg/L	150	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chloroaniline	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Chlorophenyl phenyl ether	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Nitroaniline	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
4-Nitrophenol	µg/L	-	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
Acenaphthene	µg/L	1300	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Acenaphthylene	µg/L	52	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Anthracene	µg/L	43	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(a)anthracene	µg/L	2.1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(a)pyrene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(b)fluoranthene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(g,h,i)perylene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Benzo(k)fluoranthene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Chloroethoxy)methane	µg/L	-	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Chloroethyl)ether	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
bis(2-Ethylhexyl)phthalate	µg/L	6	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Butyl benzylphthalate	µg/L	1200	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Carbazole	µg/L	85	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Chrysene	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dibenz(a,h)anthracene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dibenzofuran	µg/L	1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Diethyl phthalate	µg/L	5500	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Dimethyl phthalate	µg/L	73000	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Di-n-butylphthalate	µg/L	880	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Di-n-octyl phthalate	µg/L	130	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Fluoranthene	µg/L	210	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Fluorene	µg/L	880	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorobenzene	µg/L	1	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorobutadiene	µg/L	15	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachlorocyclopentadiene	µg/L	50	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Hexachloroethane	µg/L	7.3	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Indeno(1,2,3-cd)pyrene	µg/L	2	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Isophorone	µg/L	770	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Naphthalene	µg/L	520	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Nitrobenzene	µg/L	3.4	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
N-Nitrosodi-n-propylamine	µg/L	5	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
N-Nitrosodiphenylamine	µg/L	270	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Pentachlorophenol	µg/L	1	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)
Phenanthrene	µg/L	52	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Phenol	µg/L	4400	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Pyrene	µg/L	140	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)

Note:

ND - Non-detect at associated value

TABLE 2.5

ANALYTICAL RESULTS SUMMARY - METALS
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW84-1S*	*MW84-4S*	*MW84-5S*	*MW84-5S*	*MW84-6S*	*MW86-6S*	*MW90-3S*	*MW90-4S*	*MW90-4S*	*MW95-1S*	*MW95-2S*
Sample ID:			*GW-12210-091802-BW-024*	*GW-12210-091802-BW-022*	*GW-12210-091902-BW-029*	*GW-12210-091902-BW-030*	*GW-12210-091802-BW-027*	*GW-12210-091902-BW-031*	*GW-12210-091902-BW-037*	*GW-12210-091802-BW-020*	*GW-12210-091802-BW-021*	*GW-12210-091702-BW-011*	*GW-12210-091702-BW-019*
Sample Date:			*9/18/2002*	*9/18/2002*	*9/19/2002*	*9/19/2002 Duplicate*	*9/18/2002*	*9/19/2002*	*9/19/2002*	*9/18/2002*	*9/18/2002 Duplicate*	*9/17/2002*	*9/17/2002*
Parameter	*Units*	*Part 201 DWC*											
Metals													
Aluminum	mg/L	0.05	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0 02)	ND (0.02)	ND (0.02)	ND (0 02)
Aluminum (Dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	ND (0 02)	-
Antimony	mg/L	0.006	ND (0.02)	ND (0.02)	ND (0.02)	ND (0 02)	ND (0.02)	ND (0 02)	ND (0 02)	ND (0 02)	ND (0.02)	ND (0.02)	ND (0.02)
Antimony (Dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	ND (0.02)	-
Arsenic	mg/L	0.05	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.062 J	ND (0.005)
Arsenic (Dissolved)	mg/L	0 05	-	-	-	-	-	-	-	-	-	0.05 J	-
Barium	mg/L	2	0.09	0.12	0.04	0 04	0.07	0.11	0.04	0.16	0 15	0.38	0.05
Barium (Dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	0.38	-
Beryllium	mg/L	0.004	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0 001)	ND (0.001)	ND (0 001)	ND (0.001)	ND (0.001)	ND (0.001)
Beryllium (Dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	ND (0.001)	-
Cadmium	mg/L	0.005	ND (0 001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0 004	ND (0.001)	ND (0 001)	ND (0.001)	ND (0.001)	ND (0.001)
Cadmium (Dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	ND (0.001)	-
Calcium	mg/L	-	88 9	156	93.9	91	78.5	162	93.2	113	111	71.6	66.9
Calcium (Dissolved)	mg/L	-	-	-	-	-	-	-	-	-	-	70.5	-
Chromium Total	mg/L	0.1	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Chromium Total (Dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	ND (0 01)	-
Cobalt	mg/L	0.04	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0 01)
Cobalt (Dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	ND (0 01)	-
Copper	mg/L	1	ND (0.01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0.01)	0.02	ND (0.01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0 01)
Copper (Dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	ND (0 01)	-
Cyanide (total)	mg/L	0.2	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	-	ND (0.01)
Iron	mg/L	0.3	0.88	ND (0 02)	0.03	ND (0.02)	ND (0.02)	123	0 09	ND (0.02)	ND (0.02)	9.6	ND (0.02)
Iron (Dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	9.48	-
Lead	mg/L	0.004	ND (0.002)	ND (0.002)	0.002	ND (0.002)	ND (0.002)	0.251	ND (0.002)	ND (0.002)	ND (0 002)	0.003	0.003
Lead (Dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	ND (0 002)	-
Magnesium	mg/L	400	35.7	50.5	35.7	34.7	27.4	57.3	27.3	26.2	25.4	87.6	22.2
Magnesium (Dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	87.3	-
Manganese	mg/L	0.05	0.12	ND (0.01)	ND (0.01)	ND (0.01)	0.03	0.24	0.08	0.68	0.65	0.05	ND (0.01)
Manganese (Dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	0.06	-
Mercury	mg/L	0.002	ND (0.0002) UJ	ND (0.0002) UJ	ND (0.0002) UJ	ND (0.0002) UJ	ND (0.0002) UJ	ND (0.0002) UJ	ND (0.0002) UJ	0.014 J	ND (0.0002) UJ	ND (0.0002)	ND (0.0002)
Mercury (Dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	ND (0.0002)	-
Nickel	mg/L	0.1	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0 01)	ND (0.01)	ND (0.01)	0.02	ND (0.01)
Nickel (Dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	0.02	-
Potassium	mg/L	-	2	0.5	ND (0.5)	ND (0.5)	0.7	0.9	0.9	2	2	.5	0.5
Potassium (Dissolved)	mg/L	-	-	-	-	-	-	-	-	-	-	4	-
Selenium	mg/L	0.05	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)
Selenium (Dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	ND (0 005)	-
Silver	mg/L	0.034	0.02	0.03	ND (0.01)	ND (0.01)	0.02	ND (0.01)	ND (0.01)	0.02	0.02	0.01	0.01
Silver (Dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	0.01	-
Sodium	mg/L	120	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	50	ND (10)
Sodium (Dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	60	-
Thallium	mg/L	0.002	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0 005)	ND (0 005)	ND (0.005)
Thallium (Dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	ND (0.005)	-
Vanadium	mg/L	0.0045	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Vanadium (Dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	ND (0.01)	-
Zinc	mg/L	2 4	ND (0 02)	ND (0.02)	0.05	0.04	ND (0.02)	29.1	0 06	ND (0.02)	ND (0.02)	ND (0 02)	ND (0 02)
Zinc (Dissolved)	mg/L	2 4	-	-	-	-	-	-	-	-	-	ND (0 02)	-

Notes:

J - Estimated.
ND - Non-detect at associated value.
U - Non-detect at associated value.
UJ - The analyte was not detected above the sample quantitation limit. The reported quantitation is an estimated quantity.
- - Not applicable.
[ ] - Exceeds Part 201 Drinking Water Criteria

TABLE 2.6

ANALYTICAL RESULTS SUMMARY - GENERAL CHEMISTRY
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW84-1S*	*MW84-4S*	*MW84-5S*
Sample ID:			*GW-12210-091802-BW-024*	*GW-12210-091802-BW-022*	*GW-12210-091902-BW-029*
Sample Date:			*9/18/2002*	*9/18/2002*	*9/19/2002*
Parameter	*Units*	*Part 201 DWC*			
General Chemistry					
Aerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	-
Aerobic Total Microbial Population	cfu/mL	-	-	-	-
Alkalinity, Total (As CaCO3)	mg/L	-	-	-	-
Ammonia	mg/L	10	-	-	-
Anaerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	-
Anaerobic Total Microbial Population	cfu/mL	-	-	-	-
Biochemical Oxygen Demand (BOD)	mg/L	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	-	-	-	-
Chloride	mg/L	250	-	-	-
Dissolved Organic Carbon (DOC)	mg/L	-	-	-	-
Dissolved Oxygen (DO)	mg/L	-	2.99	0.9	5.73
Hardness	mg/L	-	-	-	-
Iron	mg/L	0.3	**0.88**	ND (0.02)	0.03
Nitrite/Nitrate	mg/L	-	-	-	-
Orthophosphate	mg/L	-	-	-	-
Oxidation reduction potential	millivolts	-	148	92	264
Phosphorus	mg/L	63	-	-	-
Sulfate	mg/L	250	-	-	-
Sulfide	mg/L	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	-	-

Notes:

ND - Non-detect at associate value.
- - Not applicable.
[ ] - Exceeds Part 201 Drinking Water Criteria.

TABLE 2.6

ANALYTICAL RESULTS SUMMARY - GENERAL CHEMISTRY
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW84-5S*	*MW84-6S*	*MW86-6S*	*MW90-3S*
Sample ID:			*GW-12210-091902-BW-030*	*GW-12210-091802-BW-027*	*GW-12210-091902-BW-031*	*GW-12210-091902-BW-037*
Sample Date:			*9/19/2002*	*9/18/2002*	*9/19/2002*	*9/19/2002*
Parameter	*Units*	*Part 201 DWC*				
General Chemistry						
Aerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	-	-
Aerobic Total Microbial Population	cfu/mL	-	-	-	-	-
Alkalinity, Total (As CaCO3)	mg/L	-	-	-	-	-
Ammonia	mg/L	10	-	-	-	-
Anaerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	-	-
Anaerobic Total Microbial Population	cfu/mL	-	-	-	-	-
Biochemical Oxygen Demand (BOD)	mg/L	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	-	-	-	-	-
Chloride	mg/L	250	-	-	-	-
Dissolved Organic Carbon (DOC)	mg/L	-	-	-	-	-
Dissolved Oxygen (DO)	mg/L	-	-	5.24	0.19	4.11
Hardness	mg/L	-	-	-	-	-
Iron	mg/L	0.3	ND (0.02)	ND (0.02)	**123**	0.09
Nitrite/Nitrate	mg/L	-	-	-	-	-
Orthophosphate	mg/L	-	-	-	-	-
Oxidation reduction potential	millivolts	-	-	238	50	59
Phosphorus	mg/L	63	-	-	-	-
Sulfate	mg/L	250	-	-	-	-
Sulfide	mg/L	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	-	-	-

Notes:

ND - Non-detect at associate value.
- - Not applicable.
[ ] - Exceeds Part 201 Drinking Water Criteria.

TABLE 2.6

ANALYTICAL RESULTS SUMMARY - GENERAL CHEMISTRY
GROUNDWATER SAMPLING - WELL SPECIFIC
FOREST WASTE
SEPTEMBER 2002

Sample Location:			*MW90-4S*	*MW90-4S*	*MW95-1S*	*MW95-2S*
Sample ID:			*GW-12210-091802-BW-020*	*GW-12210-091802-BW-021*	*GW-12210-091702-BW-011*	*GW-12210-091702-BW-019*
Sample Date:			*9/18/2002*	*9/18/2002*	*9/17/2002*	*9/17/2002*
Parameter	*Units*	*Part 201 DWC*				
General Chemistry						
Aerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	390	-
Aerobic Total Microbial Population	cfu/mL	-	-	-	1200	-
Alkalinity, Total (As CaCO3)	mg/L	-	-	-	496	-
Ammonia	mg/L	10	-	-	**17.3**	-
Anaerobic BTEX Specific Microbial Population	cfu/mL	-	-	-	90	-
Anaerobic Total Microbial Population	cfu/mL	-	-	-	760	-
Biochemical Oxygen Demand (BOD)	mg/L	-	-	-	0	-
Chemical Oxygen Demand (COD)	mg/L	-	-	-	480	-
Chloride	mg/L	250	-	-	140	-
Dissolved Organic Carbon (DOC)	mg/L	-	-	-	150	-
Dissolved Oxygen (DO)	mg/L	-	0.23	-	2	7.24
Hardness	mg/L	-	-	-	750	-
Iron	mg/L	0.3	ND (0.02)	ND (0.02)	**9.6**	ND (0.02)
Nitrite/Nitrate	mg/L	-	-	-	ND (0.01)	-
Orthophosphate	mg/L	-	-	-	6.7	-
Oxidation reduction potential	millivolts	-	49	-	35	227
Phosphorus	mg/L	63	-	-	1.5	-
Sulfate	mg/L	250	-	-	ND (5)	-
Sulfide	mg/L	-	-	-	0.07	-
Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	-	18	-

Notes:

ND - Non-detect at associate value.
- - Not applicable.
[ ] - Exceeds Part 201 Drinking Water Criteria.

APPENDICES

APPENDIX A

DATA QUALITY ASSESSMENT AND VALIDATION MEMORANDUM

CONESTOGA-ROVERS & ASSOCIATES

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MEMORANDUM

TO:	Mike Mateyk	REF. NO.:	12210-10
FROM:	Kathy Hasenfratz/tl/30/Det.	DATE:	April 29, 2003
RE:	Data Quality Assessment and Validation Groundwater Monitoring Forest Waste Site – Otisville, MI		

The following details a quality assessment and validation of the analytical data resulting from the September 17 through 19, 2002, collection of eight (8) groundwater samples and two (2) quality control samples from the Forest Waste Site in Otisville, MI. The sample summary detailing sample identification, sample location, quality control samples and analytical parameters is presented in Table 1. Sample analysis was completed at Southern Petroleum Laboratory in Scott, Louisiana (SPL), and Severn Trent Laboratory in North Canton, Ohio (STL) in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods.

Sample Preservation

Samples collected for cyanide (total) analysis are to be maintained at pH greater than 12 during shipment and laboratory storage. The samples were received by the laboratory at a pH of 9. The samples summarized in Table 3 should be qualified due to violation of sample preservation. The remaining samples were shipped and maintained in accordance with the sample preservation requirements.

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 4. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by SPL & STL, were prepared and analyzed within the required holding time periods.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. Mercury was reported as detected in a method blank, but was reported as non-detect in the associated samples, therefore no qualification was required. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no additional laboratory-attributable contamination occurred.

[1] Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-99/008, October 1999 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses serve as a monitor of the overall performance in all steps of the sample analysis. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all samples.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Inorganic Analyses

Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) of the concentrations were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. The site-specific samples selected for MS.MSD analysis are identified in Table 1. Non Site-specific samples were also utilized as MS/MSD, therefore effects of sample matrix on laboratories digestion and measurement methods could not be determined. Qualification of samples associated with these MS/MSD's was not performed. The samples that should be qualified due to violation of MS/MSD percent recovery criteria are outlined in Table 5. The remaining MS/MSD percent recoveries and associated RPDs were within the acceptance criteria.

Duplicate Sample Analyses - Inorganic Analyses

The laboratory precision of matrix-specific metals methods was monitored by the analyses of duplicate samples. The duplicate relative percent difference (RPD) data were within the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices MS/MSD percent recoveries and the RPD of the concentrations were determined. The MS/MSD percent recoveries and associate RPDs acceptance criteria were met for all analyses. The MS/MSD percent recoveries and associated RPDs acceptance criteria were met for all analyses. Non Site-specific samples were also utilized as MS/MSDs therefore, qualification of samples associated with these MS/MSDs was not performed.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of two (2) field duplicate sample sets and three (3) trip blank samples.

Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample sets. Table 6 summarizes the results of the detected analytes in the field duplicate sample sets. The data indicate that an adequate level of precision was achieved for the sampling event.

To monitor potential cross-contamination of VOC during aqueous sample transportation and storage, a trip blank was submitted to the laboratory for VOC analysis with each shipping cooler containing multiple samples. No target analytes were reported as detected in the trip blank samples.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

TABLE 1

SAMPLE SUMMARY
FOREST WASTE SITE
OTISVILLE, MICHIGAN

Sample Identification	*Sample Location*	*Matrix*	*QC Sample*	*Parameters*
GW-12210-091702-BW-011	MW95-1S	Water	MS/MSD (VOC, Metals - D, Gen Chem)[1]	TCL VOC, TAL Metals T&D, Gen Chem
GW-12210-091802-BW-020	MW90-4S	Water		TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091802-BW-021	MW90-4S	Water	Duplicate (020)	TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091802-BW-022	MW84-4S	Water		TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091802-BW-024	MW84-1S	Water		TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091802-BW-027	MW84-6S	Water	MS/MSD	TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091902-BW-029	MW84-5S	Water	MS/MSD (Metals, Cyanide)	TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091902-BW-030	MW84-5S	Water	Duplicate (029), MS/MSD (Metals)	TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091902-BW-031	MW86-6S	Water		TCL VOC, TCL SVOC, TAL Inorganics
GW-12210-091902-BW-037	MW90-3S	Water		TCL VOC, TCL SVOC, TAL Inorganics

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TCL - Target Compound List

VOC - Volatile Organic Compounds

TAL - Target Analyte List

T&D - Total and Dissolved

Gen Chem - General Chemistry - dissolved organic carbon (DOC), nitrate/nitrite, sulfide, sulfate, hardness, alkalinity, chloride, dissolved gases, ammonia nitrogen, COD, BOD, total phosphorus

QC - Quality Control

MS/MSD - Matrix Spike /Matrix Spike Duplicate

[1] - Laboratory utilized sample as MS/MSD for parameters in parenethesis.

TABLE 2

SUMMARY OF ANALYTICAL METHODS
FOREST WASTE SITE
OTISVILLE, MICHIGAN

Parameter	*Method*
TCL VOC	SW-846 8260B [1]
TCL SVOC	SW-846 8270C
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6010B
Arsenic	SW-846 7060A
Barium	SW-846 6010B
Beryllium	SW-846 7091
Cadmium	SW-846 7131A
Calcium	SW-846 6010B
Chromium	SW-846 6010B
Cobalt	SW-846 6010B
Copper	SW-846 6010B
Iron	SW-846 6010B
Lead	SW-846 7421
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7470A
Nickel	SW-846 6010B
Potassium	SW-846 7610
Selenium	SW-846 7740
Silver	SW-846 6010B
Sodium	SW-846 7770
Thallium	SW-846 7841
Total Cyanide	SW-846 9010B
Vanadium	SW-846 6010B
Zinc	SW-846 6010B
DOC	EPA-WW 415.1[2]
Nitrate/Nitrite	EPA-WW 353.3
Sulfide	EPA-WW 376.2
Sulfate	EPA-WW 375.4

TABLE 2

SUMMARY OF ANALYTICAL METHODS
FOREST WASTE SITE
OTISVILLE, MICHIGAN

Parameter	*Method*
Alkalinity	EPA-WW 310.1
Chloride	EPA-WW 325.3
Dissolved gases	RSK SOP-175[3]
Ammonia nitrogen	EPA-WW 350.2
COD	EPA-WW 410.4
BOD	EPA-WW 405.1
Total phosphorus	EPA-WW 365.2

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[1] SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and Promulgated updates, November 1986

[2] EPA-WW - "Methods for Chemical Analysis of Water and Waste," EPA-600/4-79-020, revised March 1983.

[3] EPA RSK-175-EPA Internal Standard Operating Procedure dated 8/11/94 by Bryan Newell at R.S. Kerr Laboratory in Oklahoma.

TABLE 3

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO SAMPLE PRESERVATION FOREST WASTE SITE OTISVILLE, MICHIGAN

Analysis	*Parameters*	*Associated Samples*	*Qualifier* [1]
TAL Inorganics	Cyanide	GW-12210-091802-BW-020	UJ
		GW-12210-091802-BW-021	
		GW-12210-091802-BW-022	
		GW-12210-091802-BW-024	
		GW-12210-091802-BW-027	
		GW-12210-091902-BW-029	
		GW-12210-091902-BW-030	
		GW-12210-091902-BW-031	
		GW-12210-091902-BW-037	

[1] The analyte should be qualified for the listed samples as:

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise

TABLE 4

HOLDING TIME PERIODS
FOREST WASTE SITE
OTISVILLE, MICHIGAN

Analysis	*Holding Time Period*
TCL VOC	- 14 days from sample collection to completion of analysis
TCL SVOC	- 7 days from sample collection to extraction - 40 days from extraction to completion of analysis
TAL Inorganics-	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Cyanide	- 14 days from sample collection to completion of Analysis
DOC, Chloride, Sulfate, Nitrate+Nitrite, Ammonia, COD, Phosphorus-total	- 28 days from sample collection to completion of analysis
Hardness	- 180 days from sample collection to completion of analysis
Alkalinity, Dissolved Gases	- 14 days from sample collection to completion of analysis
BOD	- 48 hours from sample collection to completion of analysis
Sulfide	- 7 days from sample collection to completion of analysis

TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO VIOLATION OF INORGANIC MATRIX SPIKE/MATRIX SPIKE DUPLICATE ACCEPTANCE CRITERIA FOREST WASTE SITE OTISVILLE , MICHIGAN

Analysis	*Parameters*	*Associated Samples*	*Qualifiers*[1]
TAL Inorganics - Total	Arsenic	GW-12210-091702-BW-011	J
TAL Inorganics - Dissolved	Arsenic	GW-12210-091702-BW-011	UJ
TAL Inorganics - Total	Mercury	GW-12210-091802-BW-020 GW-12210-091802-BW-021 GW-12210-091802-BW-022 GW-12210-091802-BW-024 GW-12210-091802-BW-027 GW-12210-091902-BW-029 GW-12210-091902-BW-030 GW-12210-091902-BW-031 GW-12210-091902-BW-037	J/UJ
General Chemistry	Alkalinity Sulfate	GW-12210-091702-BW-011	J UJ

[1] The parameter results should be qualified for the listed samples as:

J - The associated value is an estimated quantity (for detected parameters).

UJ - The material was analyzed for, but was not detected.
The sample associated value is an estimate and may be inaccurate or imprecise (for non-detected parameters).

TABLE 6

SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SETS
FOREST WASTE SITE
OTISVILLE, MICHIGAN

Parameter	*Investigative Sample*	*Duplicate Sample*	*RPD* [1]
	GW-12210-091802-BW-020	GW-12210-091802-BW-021	
TAL Metals - Total (mg/L)			
Mercury	0.014 J[2]	ND (0.0002)[3] UJ[4]	NC[5]
Potassium	2	2	0
Barium	0.16	0.15	6.5
Calcium	113	111	1.8
Magnesium	26.2	25.4	3.1
Manganese	0.68	0.65	4.5
Silver	0.02	0.02	0
TCL VOC (µg/L)			
Toluene	2	2	0
	GW-12210-091902-BW-029	GW-12210-091902-BW-030	
TAL Metals - Total (mg/L)			
Lead	0.002	ND (0.002)	NC
Barium	0.04	0.04	0
Calcium	93.9	91	3.1
Iron	0.03	ND (0.0200)	NC
Magnesium	35.7	34.7	2.8
Zinc	0.05	0.04	22

[1] RPD - Relative Percent Difference
[2] J - The associated numerical value is an estimated quantity.
[3] ND( ) - Not detected at the quantitation limit stated in parentheses.
[4] UJ - The material was analyzed for, but was not detected. The associated sample value is an estimate and may be inaccurate or imprecise.
[5] NC - Not calculable.